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ABSTRACT

This task-based curriculum guide is intended to help secondary teachers provide relevant training for an entry-level job in mechanical drafting. Introductory materials include background information on trade and industrial education and program goals and safety information. Descriptions follow of the construction trades program, vocational cooperative education, work experience/unpaid work experience, work experience and career exploration programs, and vocational work study. This job information is then provided: job titles and a task inventory for mechanical drafting. Tasks are grouped under these 20 duties: preparation, basic drawing, geometric construction, pictorial drawing, orthographic projection, dimensioning, sectional views, auxiliary views, thread and fastening techniques, shop processes, job entry skills, casting drawing, detailing drawing, assembly drawing, descriptive geometry skills, body drafting, cam and gear layout, technical illustrating, electronic drawing, and employability skills. Duty tabs comprise the largest portion of the curriculum guide. Each task in the listing is presented in a one-page format that provides this information: duty, task, achievement indicators, criteria, tools and equipment, and resources. Other components of the curriculum guide include a tool and equipment list, a student achievement record, a class achievement record, a glossary of vocational terms, and a resource list. (YLB)

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MICHIGAN TRADE & INDUSTRIAL EDUCATION
CURRICULUM GUIDE

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1982-83
School Year

INTRODUCTION

The Michigan Department of Education, Vocational-Technical Education Service, has adopted descriptions and codes for vocational-technical education programs found in the document entitled, "A Classification of Instructional Programs" (C.I.P.) National Center for Educational Statistics, February, 1981. This new coding system is required of all states in reporting data on all programs receiving funds under P.L. 94-482, the Vocational Education Amendments of 1976.

The current United States Office of Education (U.S.O.E.) coding system was discontinued at the conclusion of the 1981-82 school year. The 1982-83 school year is a transition year from the U.S.O.E. code system to the new C.I.P. Code system.

This Michigan Trade and Industrial Education Curriculum Guide uses the new C.I.P. program description code(s) and lists the entry level job titles associated with the occupational program area by the Dictionary of Occupational Titles (Fourth Edition, 1977), D.O.T. Code, and the Michigan Occupational Information System, (M.O.I.S.), Numerical Index code. NOTE: This information is located under Job Information with program description(s).

PROGRAM DEFINITIONS/GOALS

Vocational Education

The term "vocational education" means organized educational programs which are directly related to the preparation for paid or unpaid employment or for additional preparation for a career requiring other than a baccalaureate or advanced degree.[1]

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[1] The Education Amendments of 1976, Section 195(1), Public Law 94-482.

Goals of Vocational-Technical Education

(1) To provide persons with differing sex, age, racial/ethnic backgrounds, social-economic status, academic disadvantage, economic disadvantage, limited English speaking ability, physical and mental capabilities, and geographical location access to vocational-technical education training or retraining.

(2) To coordinate pre-vocational exploration, career guidance, and placement programs so that each student may make informed and realistic occupational choices and have access to quality placement programs.

(3) To provide all students with learning experiences which are realistic and sufficient in light of their occupational objective.

(4) To insure that all vocational-technical programs will be planned, monitored, and evaluated in light of actual or anticipated employment opportunities and the demand by students for programs related to their abilities and occupational objectives.

Trade and Industrial Education

A vocational education curriculum that includes programs for manufacturing, construction, mechanical service, public service, health service, technical, and fisheries occupations, that prepares a person for entry level employment, upgrading or retraining in a semiskilled or skilled trade, semiprofessional or technical occupation, not generally classified as Agriculture, Distributive, Business or Office, in the Health profession, or Consumer/Home Economics in nature.

NOTE: The occupational clusters found within the scope of trade and industrial education include skilled or semiskilled trade, craft, or occupations which directly relate to the designing, producing, processing, assembling, maintaining, servicing, or repairing of any manufactured product.

TRADE AND INDUSTRIAL EDUCATION STUDENT ORGANIZATION

VICA

The Vocational Industrial Clubs of America (VICA) is the national organization serving trade, industrial, technical, and health occupations students in the United States. VICA incorporates leadership, citizenship, and character development programs and activities into the skill training offered in America's schools and taught by men and women who have worked in the occupational areas in which they now instruct their students.

VICA emphasizes respect for the dignity of work, high standards in trade ethics, workmanship, scholarship, and safety. VICA promotes understanding of the free enterprise system and encourages development of patriotism through the practice of democracy within the club.

Competitive activities in the trade skills as well as areas such as public speaking, job interview, parliamentary procedure and safety are vital aspects of VICA's program.

TRADE AND INDUSTRIAL EDUCATION CURRICULUM GUIDE

This Michigan Trade and Industrial Education Curriculum Guide is the result of a project funded by the Michigan State Board of Education and the Michigan Department of Education, Vocational-Technical Education Service. The project is located at Michigan State University in the College of Agriculture and Natural Resources' Education Institute (ANREI) and is known as the Curriculum Resource Team.

The project is directed by Dr. Chris M. Olson and Ms. Carol E. Culpepper, Faculty Specialist, Curriculum Resource Team Coordinators. They were responsible for developing the curriculum format and working with a task force leader and committee of individuals from business, industry, and education to ensure the quality of the curriculum. The development of this curriculum was monitored by Melvin France, Secondary Trade and Industrial Education Supervisor.

The names of the occupational task force leader(s) committee members, secretaries, and other support staff are acknowledged after this Introduction.

The occupational program area(s) selected for curriculum development are based on a Vocational-Technical Education Service prioritized program ranking based on employment demand, State average percent of placement, reimbursed enrollments, the number of programs, and entry level wages within the State of Michigan.

This curriculum guide was developed from the results of a statewide survey and job analysis of incumbent workers in the related occupational areas.

The curriculum guide is representative of the occupational job duty categories which list major activities and tasks performed on an entry level job. The curriculum guide contains a resource list and criteria statements which indicate the minimum standards of performance accepted as evidence of competence in completion of the task by business and industry. This is a task-based curriculum guide which helps a teacher develop a classroom management system where students learn by doing. It is based on task analysis and reflects the skills, knowledge, and attitudes that employers expect incumbent workers to possess.

The curriculum is linked to the labor market, helps the instructor open communication channels with business and industry, and manage classroom instruction where students learn "Need-to-Know" instead of "Nice-to-Know" facts.

This curriculum is adaptable for special needs/handicapped students, helps to validate the program, prepares students for entry level jobs and helps students to make career choices related to job placement.

It is the intent by all those involved in the development of this curriculum guide that it be used to provide relevant training or retraining for employment in the world of work.

The secondary occupational programs/courses in Michigan should meet the following minimum standards to assure soundness and quality of instruction:

(1) The program of instruction must be based on a consideration of the skills and knowledge required in the occupation for which the

instruction is being provided, and includes a planned logical sequence for those essentials of education or experience deemed necessary for the individual to meet an occupational objective.

(2) The program of instruction must be developed and conducted in consultation with a Local Advisory Council/Committee which has an appropriate representation of both sexes and an appropriate representation of racial and ethnic minorities found in the program area, school, and community origin. The local advisory council will advise on current job needs, relevance of programs, and courses in meeting current job needs and consult with the local educational agency in developing program application.

(3) The program of instruction will include the most up-to-date curriculum based on the competencies required in the occupation or occupational field in which the individual is being prepared, upgraded, or updated.

(4) The program of instruction will be sufficiently extensive in duration and intensive within a schedule unit of time to enable the student to develop the necessary knowledge, attitudes, and skills necessary for employment in the occupation or occupational field.

(5) The program of instruction will combine and coordinate related instruction with field, shop, laboratory, cooperative work, or other occupational experience which is appropriate to the vocational objective of the student, is of sufficient duration to develop competencies necessary for employment in the occupation or occupational field, and supervised, directed, or coordinated by a person qualified under the State Plan.

Facilities, equipment, and instructional materials:

(1) Classrooms, libraries, shops, laboratories, and other facilities, including instructional equipment, supplies, teaching aids, and other materials will be adequate in supply and quality to meet the standards approved by the State Board so that such facilities are adequate to enable those who are to be trained to meet the occupational objective for which the education is intended.

(2) If the State Board or local educational agency cannot provide adequate facilities and materials, and such are available in a business or industrial establishment, funds may be used to reimburse the local public educational agency for training programs conducted in private industry when it complies with the training standards and regulations established by the State Board. Such instruction shall be under the supervision and administration of a local public educational agency.

ACKNOWLEDGEMENT

The Michigan Trade and Industrial Curriculum Guide(s) were developed through a series of workshops held throughout the State and at Michigan State University during the 1982-83 school year.

Appreciation is given to all who have contributed their thoughts, time and energy to this curriculum project.

The Michigan Department of Education, Vocational-Technical Education Service, is indebted to the following individuals who were instrumental in the completion of this project and the development of the materials:

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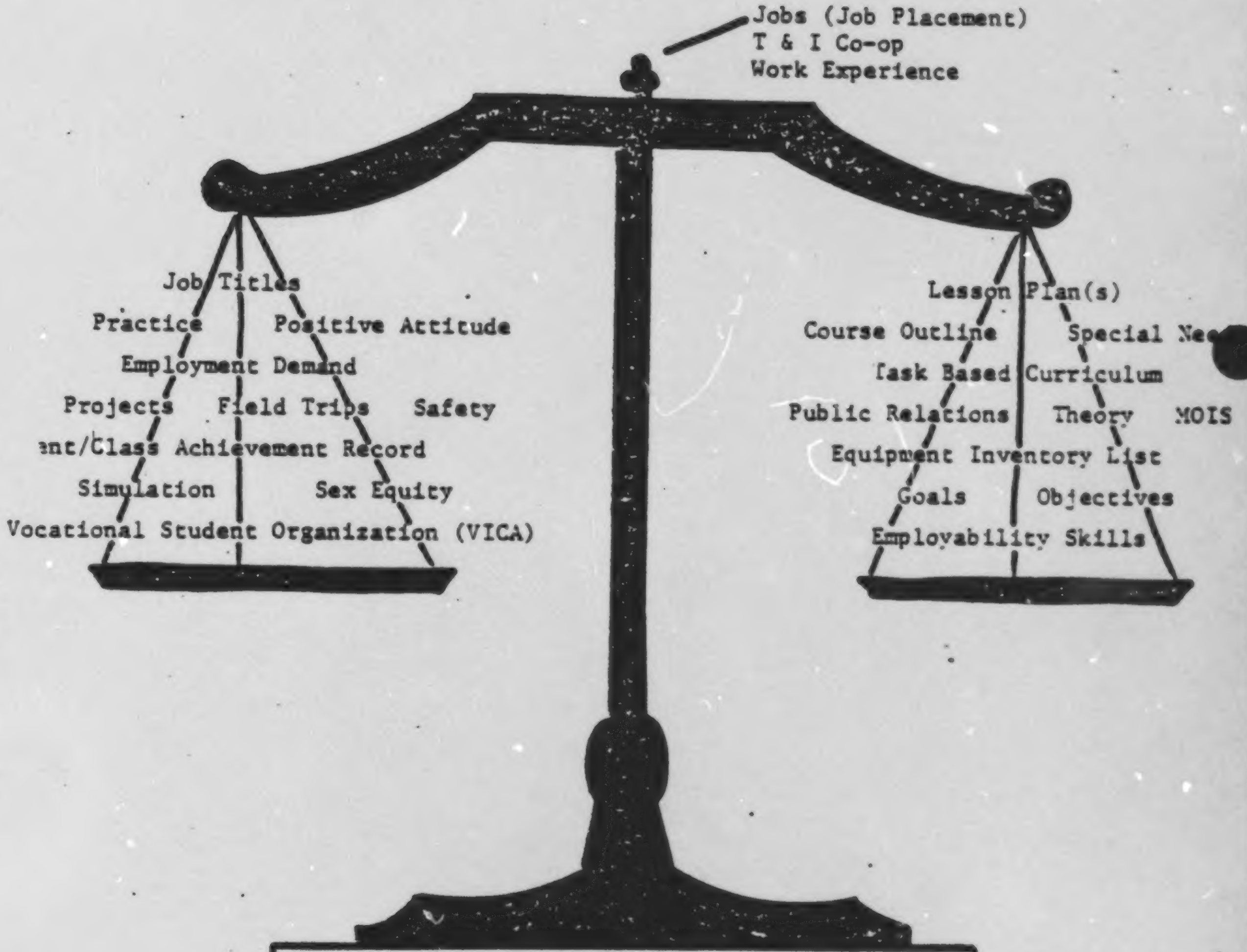
MICHIGAN TRADE AND INDUSTRIAL EDUCATION

IS YOURS A BALANCED PROGRAM?


Jobs (Job Placement)
T & I Co-op
Work Experience
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Projects
Field Trips
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ADEQUATE FACILITY
VOCATIONAL CERTIFIED INSTRUCTOR
PERSONAL APPEARANCE
ROOM APPEARANCE
ACTIVE ADVISORY COMMITTEE
VOCATIONAL ADMINISTRATOR

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Melvin France
T & I Supervis

DEPARTMENT OF EDUCATION

STATE BOARD OF EDUCATION

EYE PROTECTIVE DEVICES

Filed with Secretary of State,

These rules take effect 15 days after filing with the Secretary of State

(By authority conferred on the state board of education by section 585a of Act No. 269 of the Public Acts of 1955, as added, being section 340.585a of the Compiled Laws of 1948.)

R 340.1301. Definitions.

Rule 1. As used in these rules:

(a) "Caustic" or "acid" means a material, exclusive of hot water or steam, capable of destroying, eroding or burning of flesh by chemical action.

(b) "Explosive material" means a substance capable of a large-scale, rapid and spectacular expansion which will propel materials in a manner causing injury to the human body.

(c) "Hot liquid" or "solid" means a material having effects that are physically harmful to the eyes.

(d) "Sanitizing" means the disinfecting and cleaning of eye protective devices before use.

(e) "When exposure to eye danger exists" means the exposure when a person is within that distance from sparks, flying particles, rays, molten metal, fumes, glare, glass breakage or chemical splash that such an object or condition could cause damage to his eyes, if he was not using a protective device.

R 340.1302. Educational courses requiring eye protection.

Rule 2. A public educational agency which enrolls students in the following courses when exposure to eye danger exists, shall furnish eye protective devices: vocational or industrial arts shops or laboratories involving the use of or working with hot molten metals, milling, sawing, turning, shaping, grinding, cutting or stamping of any solid materials; heat treatment, tempering or kiln firing of any metal or other materials; gas or electric arc welding; repair or servicing of any vehicles; caustic or explosive materials; or chemical or combined chemical-physical laboratory work involving acid, caustic or explosive chemicals or hot liquids or solids.

(2) The standards described in subrule (1) are taken from the American National Standards Safety Code Z87.1-1968, figure 8, page 28, which is available from the American National Standards Institute, Incorporated, 1430 Broadway, New York, New York 10018, at a cost of $5.00. Applicable excerpts from the American National Standards Safety Code are available at no cost from the Michigan department of education, Lansing, Michigan.

R 340.1304. Sanitization of devices.

Rule 4. An eye protective device shall be sanitized when 2 or more students use the same device, by either:

(a) Washing after each use in warm water and soap or detergent, followed by a rinse in running water.

(b) Placing in a cabinet with ultraviolet light and washing once a week as in subdivision (a).

R 340.1305. Compliance.

Rule 5. (1) A superintendent of a school district shall certify to the intermediate school district superintendent not later than the second week of each school year, on forms prescribed by the Michigan department of education, that eye protective devices meeting the standards of these rules have been obtained. For the school year 1972-73, certification shall be made within 4 weeks after the effective date of these rules. This certification shall also indicate that instructors have been informed that all students, teachers and visitors shall wear the devices when exposure to eye damage exists, as identified in these rules.

(2) An intermediate school district superintendent shall report to the state superintendent of public instruction by October 1 the names of those constituent school districts which are not in compliance with these rules. For the school year 1972-73, the report shall be made within 6 weeks after the effective date of these rules.

(3) The state superintendent of public instruction shall notify a school district in violation of these rules that it shall comply or show cause why compliance cannot be made within 30 days.

R 340.1303. Standards for devices.

Rule 3. (1) An eye protective device shall meet the following standards based upon the operation involved:

(a) Acetylene burning, acetylene cutting, and acetylene welding operations - welding goggles of eyecup type with tinted lenses or welding goggles of coverspec type with tinted lenses or welding goggles of coverspec type with tinted plate lenses. This protects against the primary hazards of sparks, harmful rays, molten metal and flying particles.

(b) Chemical handling operations - goggles of flexible fitting with hooded ventilation or face shield with plastic or mesh window. This protects against the primary hazards of splash, acid burns and fumes.

(c) Chipping operations - goggles of flexible fitting with regular ventilation or goggles of cushioned fitting with rigid body or spectacles of metal frame with sideshields or spectacles of plastic frame with sideshields or spectacles of metal-plastic frame with sideshields or chipping goggles of eyecup type with clear safety lenses or chipping goggles of coverspec type with clear safety lenses. This protects against the primary hazard of flying particles.

(d) Electric (arc) welding operations - welding goggles of coverspec type with tinted plate lenses or welding helmets or welding helmet in combination with tinted lens spectacles. This protects against the primary hazards of sparks, intense rays and molten metal.

(e) Furnace operations - welding goggles of eyecup type with tinted lenses or welding goggles of coverspec type with tinted lenses or welding goggles of coverspec type with tinted plate lenses. This protects against the primary hazards of glare, heat and molten metal.

(f) Light grinding, machining, and spot welding operations - goggles of flexible fitting with regular ventilation or goggles of cushioned fitting with rigid body or spectacles of metal frame with sideshields or spectacles of plastic frame with sideshields or spectacles of metal-plastic frame with sideshields or face shield with plastic or mesh window. This protects against the primary hazards of flying particles and sparks.

(g) Heavy grinding operations - goggles of flexible fitting with regular ventilation or goggles of cushioned fitting with rigid body or chipping goggles of eyecup type with clear safety lenses or chipping goggles of coverspec type with clear safety lenses or in case of severe exposure add face shield with plastic or mesh window. This protects against the primary hazard of flying particles.

(h) Laboratory operations - goggles of flexible fitting with hooded ventilation or face shield in combination with metal or plastic frame spectacles with sideshields. This protects against the primary hazards of chemical splash and glass breakage.

(i) Molten metal operations - welding goggles of eyecup type with tinted lenses or welding goggles of coverspec type with tinted lenses or face shield in combination with metal or plastic frame spectacles with sideshields and tinted lenses. This protects against the primary hazards of heat, glare, sparks and splash.

ACT NO. 54 OF THE PUBLIC ACTS OF 1972

ENROLLED SENATE BILL NO. 553

AN ACT to amend Act No. 269 of the Public Acts of 1955, entitled "The Michigan School Code", and to repeal certain acts and parts of acts, as amended, being sections 340.1 to 340.984 of the Compiled Laws of 1948, by adding section 585a.

The People of the State of Michigan enact:

Section 1. Act No. 269 of the Public Acts of 1955, as amended, being sections 340.1 to 340.984 of the Compiled Laws of 1948, is amended by adding section 585a to read as follows:

Sec. 585a. (1) Every pupil and teacher participating in a course mentioned in this section shall wear industrial quality eye protective devices, which have been sanitized prior to use, when exposure to danger exists while participating in such course. The board of education shall furnish the devices for pupils, teachers and visitors to the classrooms or laboratories. The courses for which protective devices are required are:

(a) Vocational or industrial arts shops or laboratories involving the use of or working with hot molten metals, milling, sawing, turning, shaping, grinding, cutting or stamping of any solid materials; heat treatment, tempering or kiln firing of any metal or other materials; gas or electric arc welding; repair or servicing of any vehicle; or caustic or explosive materials.

(b) Chemical or combined chemical-physical laboratory work involving acid, caustic or explosive chemicals or hot liquids or solids.

(2) "Industrial quality eye protective devices" means devices meeting the standards of the american standard safety code for head, eye and respiratory protection, Z87.1-1968, promulgated by the american standards association, incorporated.

(3) The provisions of this section shall be enforced pursuant to rules promulgated by the state board of education in accordance with and subject to Act No. 306 of the Public Acts of 1969, as amended, being sections 24.201 to 24.315 of the Compiled Laws of 1948.

Section 2. This amendatory act shall take effect September 1, 1972.

The following adapted from the:

NATIONAL STANDARD SCHOOL SHOP SAFETY INSPECTION CHECK LIST

Prepared by the Joint Safety Committee of the
AMERICAN VOCATIONAL ASSOCIATION — NATIONAL SAFETY COUNCIL

________________________________ Date________________

INTRODUCTION

A *safe* environment is an essential part of the school shop *safety* education program. The safe environment will exist only if hazards are discovered and corrected through *regular* and *frequent* inspections by school personnel—administrators, teachers and students. Safety inspections are to determine if everything is satisfactory.

Inspections may be made at the request of the board of education, the school administration or upon the initiative of the teacher. Some communities have drawn upon the cooperative service of professional safety engineers, inspectors of state labor departments, insurance companies and local safety councils to supplement and confirm inspections by school personnel.

The National Standard School Shop Safety Inspection Check List, recommended by the President's Conference on Industrial Safety is an objective inspection procedure for the school shop.

DIRECTIONS

WHO INSPECTS?

This will depend upon local policies. It is recommended, however, that shop teachers, and students—the student safety engineer and/or student safety committee—participate in making regular inspections. This not only tends to share responsibility but stimulates a broader interest in the maintenance of a safe school shop.

WHEN TO INSPECT?

As a minimum, a safety inspection should be made at the beginning of every school term or semester. More frequent inspections may be advisable.

HOW TO INSPECT?

Inspections should be well planned in advance.

Inspections should be systematic and thorough. No location that may contain a hazard should be overlooked.

Inspection reports should be clear and concise, but with sufficient explanation to make each recommendation for improvement understandable.

FOLLOW-UP

The current report should be compared with previous records to determine progress. The report should be studied in terms of the accident situation so that special attention can be given to those conditions and locations which are accident producers.

Each unsafe condition should be corrected as soon as possible in accordance with accepted local procedures.

A definite policy should be established in regard to taking materials and equipment out of service because of unsafe conditions.

The inspection report can be used to advantage as the subject for staff and class discussion.

CHECKING PROCEDURE

Draw a circle around the appropriate letter, using the following letter scheme:

S — Satisfactory (needs no attention)
A — Acceptable (needs some attention)
U — Unsatisfactory (needs immediate attention)

Recommendations should be made in all cases where a "U" is circled. Space is provided at the end of the form for such comments. Designate the items covered by the recommendations, using the code number applicable (as B-2).

In most categories, space is provided for listing of standards, requirements or regulations which have local application only.

A. GENERAL PHYSICAL CONDITION

1. Machines, benches, and other equipment are arranged so as to conform to good safety practices.......................... S A U
2. Condition of stairways.................................. S A U
3. Condition of aisles..................................... S A U
4. Condition of floors..................................... S A U
5. Condition of walls, windows, and ceiling.............. S A U
6. Illumination is safe, sufficient, and well placed....... S A U
7. Ventilation is adequate and proper for conditions..... S A U
8. Temperature control..................................... S A U
9. Fire extinguishers are of proper type, adequately supplied, properly located and maintained........................ S A U
10. Teacher and pupils know location of and how to use proper type for various fires.. S A U
11. Number and location of exits is adequate and properly identified .... S A U
12. Proper procedures have been formulated for emptying the room of pupils and taking adequate precautions in case of emergencies S A U
13. Lockers are inspected regularly for cleanliness and fire hazards. S A U
14. Locker doors are kept closed....................... S A U
15. Walls are clear of objects that might fall........... S A U
16. Utility lines are properly identified................. S A U
17. Teachers know the procedure in the event of fire including notification of the fire department and the evacuation of the building. S A U
18. Air in shop is free from excessive dust, smoke, etc.... S A U
19. ________________________________ S A U
20. ________________________________ S A U
21. ________________________________ S A U
22. ________________________________ S A U
23. Evaluation for the total rating of A. GENERAL PHYSICAL CONDITION .... S A U

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B. HOUSEKEEPING

1. General appearance as to orderliness................ S A U

2. Adequate and proper storage space for tools and materials. S A U

3. Benches are kept orderly.............................. S A U

4. Corners are clean and clear............................. S A U

5. Special tool racks, in orderly condition, and provided at benches and machines.................... S A U

6. Tool, supply, and/or material room is orderly ...... S A U

7. Sufficient scrap boxes are provided.................. S A U

8. Scrap stock is put in scrap boxes promptly.......... S A U

9. Materials are stored in an orderly and safe condition.. S A U

10. A spring lid metal container is provided for waste and oily rags. S A U

11. All waste materials and oily rags are promptly placed in the containers .... S A U

12. Containers for oily rags and waste materials are frequently and regularly emptied .... S A U

13. Dangerous materials are stored in metal cabinets..... S A U

14. Machines have been color conditioned............... S A U

15. Safety cans are provided for flammable liquids....... S A U

16. Bulk storage of dangerous materials is provided outside of the main building .... S A U

17. A toe-board or railing around a mezzanine used for storage or washing facilities .... S A U

18. Materials are stored in an orderly and safe condition on this mezzanine .... S A U

19. Flammable liquids are not used for cleaning purposes S A U

20. Floors are free of oil, water and foreign material..... S A U

21. Floors, walls, windows, and ceilings are cleaned periodically. S A U

22. ________________________________ S A U

23. ________________________________ S A U

24. ________________________________ S A U

25. ________________________________ S A U

26. Evaluation for the total rating for B. HOUSEKEEPING S A U

C. EQUIPMENT

1. Machines are arranged so that workers are protected from hazards of other machines, passing students, etc.................. S A U

2. Danger zones are properly indicated and guarded..... S A U

3. All gears, moving belts, etc., are protected by permanent enclosure guards .... S A U

4. All guards are used as much as possible............... S A U

C. EQUIPMENT (continued)

5. All equipment control switches are easily available S

6. All machines are "locked off" when instructor is out of th S

7. Brushes are used for cleaning equipment............. S

8. Nonskid areas are provided around machines........ S

9. Machines are in safe working condition.............. S

10. Machines are guarded to comply with American Standa sociation and local state code.......................... S

11. Adequate supervision is maintained when students are usi chines and dangerous tools.............................. S

12. Tools are kept sharp, clean and in safe working order S

13. All hoisting devices are in safe operating condition... S

14. Machines are shut off while unattended.... .... S

15. Adequate storage facilities for tools, equipment, etc., ne mediate use .... S

16. ________________________________ S

17. ________________________________ S

18. ________________________________ S

19. ________________________________ S

20. Evaluation for the total rating for C. EQUIPMENT.

D. ELECTRICAL INSTALLATION

1. All switches are enclosed.............................. S

2. There is a master control switch for all of the electrical i tions .... S

3. Electrical outlets and circuits are properly identified.. S

4. All electrical extension cords are in safe condition and carrying excessive loads.............................. S

5. All machine switches are within easy reach of the operat S

6. Electrical motors and equipment are wired to comply w National Electric Code.................................. S

7. Individual cut-off switches are provided for each machine S

8. Machines are provided with overload and underload con magnetic pushbutton controls........................... S

9. No temporary wiring in evidence..................... S

10. ________________________________ S

11. ________________________________ S

12. ________________________________ S

13. ________________________________

14. Evaluation for the total rating for D. ELECTR STALLATION .... S

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E. GAS

1. Gas flow to appliances is regulated, so that when appliance valve is turned on full, the flames are not too high............ S A U

2. Gas appliances are properly insulated with asbestos or other insulating material from tables, benches, adjacent walls, or other flammable materials .... S A U

3. No gas hose is used where pipe connections could be made. S A U

4. Gas appliances have been adjusted so that they may be lighted without undue hazard.................................... S A U

5. Students have been instructed when lighting gas appliances to light the match first before turning on the gas............ S A U

6. There are no gas leaks, nor is any odor of gas detectable in any part of the shop.................................... S A U

7. Shop instruction has been given concerning the lighting of gas furnaces operating with both air and gas under pressure.. S A U

8. When lighting the gas forge, goggles are worn....... S A U

9. When lighting the gas furnace, the following procedure is used: (a) light the match; (b) turn on the gas; (c) drop the match in the hole in top of the furnace.............................. S A U

10. In shutting down the gas furnace, the gas valve is closed before the air valve.. S A U

11. ______________________________ S A U

12. ______________________________ S A U

13. ______________________________ S A U

14. ______________________________ S A U

5. Evaluation for the total rating for E. GAS.......... S A U

F. PERSONAL PROTECTION

1. Goggles or protective shields are provided and required for all work where eye hazards exist........................ S A U

2. If individual goggles are not provided, hoods and goggles are properly disinfected before use.......................... S A U

3. Shields and goggles are provided for electric welding.. S A U

4. Rings and other jewelry are removed by pupils when working in the shop.. S A U

5. Proper kind of wearing apparel is worn and worn properly for the job being done.................................... S A U

6. Leggings, safety shoes, etc., are worn in special classes such as foundry, etc., when needed............................ S A U

7. Respirators are provided for dusty or toxic atmospheric conditions such as when spraying in the finishing room......... S A U

8. Provisions are made for cleaning and sterilizing respirators. S A U

9. Students are examined for safety knowledge ability.. S A U

10. Sleeves are rolled above elbows when operating machines. S A U

11. Clothing of students is free from loose sleeves, flopping ties, loose coats, etc. .... S A U

12. ...... S A U

F. PERSONAL PROTECTION (continued)

13. ______________________________ S A U

14. ______________________________ S A U

15. ______________________________ S A U

16. Evaluation for the total rating for F. PERSONAL PROTECTION. S A U

G. INSTRUCTION

1. Shop Safety is taught as an integral part of each teaching unit. S A U

2. Safety rules are posted particularly at each danger station. S A U

3. Printed safety rules are given each student.......... S A U

4. Pupils take a safety pledge.......................... S A U

5. Use of a safety inspector............................ S A U

6. Use of a student shop safety committee............... S A U

7. Use of safety contests............................... S A U

8. Motion and/or slide films on safety are used in the instruction. S A U

9. Use of suggestion box................................ S A U

10. Use of safety tests................................. S A U

11. Use of safety posters............................... S A U

12. Talks on safety are given to the classes by industrial men. S A U

13. Tours are taken of industrial plants as a means of studying safety practices .... S A U

14. Periodic safety inspections of the shop are made by a student committee .... S A U

15. Men from industry make safety inspections of the shop S A U

16. Student shop safety committee investigates all accidents S A U

17. A proper record is kept of safety instructions which are given, preferably showing the signature of student on tests given in this area .... S A U

18. Rotate students on the Shop Safety Committee so that as many students as possible have an opportunity to participate... S A U

19. ______________________________ S A U

20. ______________________________ S A U

21. ______________________________ S A U

22. ______________________________ S A U

23. Evaluation for the total rating of G. INSTRUCTION S A U

H. ACCIDENT RECORDS

1. There is a written statement outlining the proper procedure when and if a student is seriously hurt........................ S A U

2. Adequate accident statistics are kept................ S A U

3. Accidents are reported to the proper administrative authority by the instructor .... S A U

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H. ACCIDENT RECORD (continued)

4. A copy of each accident report is filed with the State Department of Education .... S A U

5. Accident reports are analyzed for instructional purposes and to furnish the basis for elimination of hazards............... S A U

6. ______________________________ S A U

7. ______________________________ S A U

8. ______________________________ S A U

9. ______________________________ S A U

10. Evaluation for the total rating of H. ACCIDENT RECORDS. S A U

I. FIRST AID

1. An adequately stocked first aid cabinet is provided...

2. The first aid is administered by a qualified individual

3. The school has individuals qualified to administer first

4. ______________________________

5. ______________________________

6. ______________________________

7. ______________________________

8. Evaluation for the total rating of I. FIRST AID....

RECOMMENDATIONS

Code No.	

For additional copies in packets of 50 send $1.42 to National Safety Council, 444 North Michigan Avenue, Chicago, Ill. 60611

Revd. 6/76
Req. 10M57601

Printed in U.S.A.

Stock No

BEST COPY AVAILABLE

C.I.P. PROGRAM DESCRIPTION

48.0101 Drafting

An instructional program that generally prepares individuals to plan, prepare, and interpret mechanical, architectural, structural, pneumatic, marine, electric/electronic, topographical, and other sketches; to use reproduction materials, equipment, and processes, to develop, plan, and process charts and drawings; to develop models; and to prepare reports and data sheets for writing specifications.

Course 01 General Drafting

An approved instructional program that prepares individuals with organized specialized learning experiences which emphasize theory, use of the drafting room, and laboratory and shopwork as each relates to gathering and translating data or specifications, including the aspects of planning, preparing, and interpreting mechanical, architectural, structural, pneumatic, marine, electrical/electronic, topographical, and other drawings and sketches. Instruction is designed to provide experiences in drawing; in the use of reproduction materials, equipment, and processes; the preparation of reports and data sheets for writing specifications; the development of plan and process charts and drawings; and the development of models. Instruction emphasizes the development of skills and knowledge essential for employment in ancillary capacities such as tracers or reproduction equipment operators, and for occupations such as mechanical draftsman, structural draftsman, detailer, marine draftsman, tool designer, fixture designer, and punch and die designer.

Course 02 Architectural Drafting

An approved instructional program that prepares individuals to support architects and engineers in developing plans for buildings or other structures using a variety of building materials. Instruction includes creating layouts and designs within the specifications of building codes, zoning laws, ordinances, and other regulations. Emphasis is placed on creating styles and plans and using materials that are within cost limitations and preferences.

VOCATIONAL COOPERATIVE EDUCATION

Definition

"The term 'cooperative education' means a program of vocational education for persons who, through written cooperative arrangements between the school and employers, receive instruction, including required academic courses and related vocational instruction by alternation of study in school with a job in any occupational field, but these two experiences must be planned and supervised by the school and employers so that each contributes to the student's education and to his or her employability. Work periods and school attendance may be on alternate half days, full days, weeks, or other periods of time in fulfilling the cooperative program." (P.L. 94-482)

Responsibilities of School District

The local school district must meet all the Federal requirements of P.L. 94-482, Section 122; 45 CFR 104.531 through 104.533 and the State of Michigan Statutes and General School Laws listed below:

A. IT IS A PROGRAM OF VOCATIONAL EDUCATION.

"Vocational program" means laboratory, simulation or instruction based upon individually designed learning experiences in a vocational subject preparing the student for competencies required in a recognized occupation coded in accordance with the most recent vocational education listing of programs by the United States Department of Education.

B. THERE IS A WRITTEN AGREEMENT BETWEEN THE SCHOOL AND EMPLOYERS.

The Youth Employment Standards Act (P.A. 90 of 1978) governs the legal employment of minors in Michigan. In section 18 of the Act, a provision is made to allow a written agreement, or contract, to be entered into between an employer and the board of education of the school district, in which the minor is enrolled. This written agreement exempts a student from obtaining a work permit and allows the student to be legally employed in Michigan. The employment, however, shall not be in violation of a Federal Statute or regulation and a signed copy of the agreement shall be on file in the place of employment before a minor begins employment. The training agreement, in cooperative education, is the legal written agreement developed cooperatively between the employer, teacher-coordinator, student, and parent and outlines the responsibilities of the employer and student to the program and establishes the legal conditions of the student-learner's employment.

C. THERE IS INSTRUCTION (INCLUDING REQUIRED ACADEMIC INSTRUCTION) IN SCHOOL RELATED TO THE JOB IN ANY OCCUPATIONAL AREA.

The program is of sufficient duration to develop competencies necessary to prepare the learner for employment. It provides a coordinated instructional program combining supervised part-time employment and classroom instruction related to the learner's job. Related vocational instruction for cooperative education enrollees shall be scheduled weekly.

D. THE ALTERNATION OF STUDY AND WORK ARE PLANNED AND SUPERVISED BY THE SCHOOL AND EMPLOYER IN ORDER TO FURTHER THE STUDENT'S EDUCATION AND EMPLOYABILITY.

The student-learner shall be employed for an average of not less than 15 hours per week during the effective time of the individual's program. The school shall have the responsibility of providing coordination and supervision services during such time.

E. STUDENTS ARE EMPLOYED AND COMPENSATED IN CONFORMITY WITH FEDERAL, STATE AND LOCAL LAWS.

The program provides cooperative on-the-job training that (1) employs and compensates student-learners in conformity with Federal, State, and local laws and regulations and in a manner not resulting in exploitation of the student-learner for private gain, and (2) is conducted in accordance with written training agreements between local education agencies and employers.

References

Individuals requiring additional information pertaining to cooperative education principles and practices are asked to consult the Michigan Department of Education, Vocational-Technical Education Service, developed Cooperative Education Handbook available in September of 1981.

WORK EXPERIENCE

PAID WORK EXPERIENCE

Definition

Paid work experience programs are school-sponsored and supervised employment programs. Students are allowed to earn academic credit while employed in the community. The employment serves as a means of acquiring desirable work habits and attitudes towards the world of work. The employment is not necessarily related to a student's career interest and enrollment in a related vocational education program is not required.

Objectives

Paid work experience programs are designed to provide students an opportunity to:

1. Foster positive attitudes about work, school and society
2. Promote an understanding in the dignity of work
3. Develop a student's ability to understand and function in an employer-employee relationship
4. Earn wages to remain in school
5. Experience an alternative to the traditional school program

Guidelines

1. Written work agreements should be completed between the employer, student, parent and school
2. Written work agreements should be completed in conformance to all Federal, State and local laws, rules and regulations; including non-discrimination against any student because of race, color, sex, national origin or ancestry. This policy of non-discrimination shall also apply to otherwise qualified handicapped individuals
3. Related academic instruction, where possible, should be provided
4. A school work experience coordinator should be provided to serve as a liaison between the student, employee, parents and school officials
5. Academic credit should be awarded for participation in the program

Funding

The Michigan Department of Education, the Vocational-Technical Education Service does not fund paid work experience programs.

UNPAID WORK EXPERIENCE

Definition

Unpaid work experience is a school sponsored and supervised instructional technique used in vocational education programs in which students are placed with an employer for a limited time and are not compensated during the duration of the experience.

Objectives

Unpaid work experience programs are designed to provide students with an opportunity to:

1. Receive on-site exposure to various businesses and industries while participating in a related vocational education program
2. Develop a realistic understanding of the relationship between education and the world of work
3. Enhance a positive self-image
4. Assist in the selection of occupational choices
5. Expand learning opportunities by using community resources

Guidelines

1. The training, even though it includes actual operation of the facilities of the participating employer is similar to that given in a vocational school
2. The training is for the benefit of the trainee
3. The trainee does not displace a regular employee, but does work under a regular employee's close observation
4. The participating employer does not derive an immediate advantage from the activities of the trainee
5. The trainee is not necessarily entitled to a job at the conclusion of the training period
6. The trainee is not entitled to wages for the time spent in the training
7. The training is for not more than 45 hours with a participating employer during each school semester
8. The training is conducted under a written work experience training agreement between the school district and the participating employer

Funding

The Michigan Department of Education, the Vocational-Technical Education Service does not fund unpaid work experience but considers it to be an allowable instructional activity under a given vocational education program.

WORK EXPERIENCE AND CAREER EXPLORATION PROGRAM
(W.E.C.E.P.)

I. Definition

The Work Experience and Career Exploration Program (W.E.C.E.P.) is a school-supervised and administered program that includes part-time work as an integral part of an educational program aimed at motivating 14 and 15 year-old youth toward education and preparing them for the world of work.

II. Program Objectives

There are several objectives of a W.E.C.E.P. program:

A. To provide a career-oriented educational program for dropout prone youth to become oriented and motivated toward education and the world of work.

B. To increase the desire to learn and improve educational performance.

C. To develop a greater degree of self-confidence, responsibility and aid in the maturation process of the student participants.

D. To provide student participants with on-the-job learning experiences that are in harmony with their interests, needs and objectives.

E. To improve school adjustment of student participants for whom the traditional curriculum is found to be inadequate.

F. To promote personal and social adjustment of the student participants and establish emotional stability through a feeling of being engaged in worthwhile activity.

III. Instructional Content

W.E.C.E.P. programs are planned so as to include part-time work supervised by employers and school personnel, as an integrated part of the enrollee's educational program. Students receive work experience on jobs permitted or approved under Federal or State laws. Students are in class with a W.E.C.E.P. teacher-coordinator for job-related and occupational safety, including needed individualized or remedial instruction. Students also receive a minimum of 20 hours of instruction on the Michigan Occupational Information System (MOIS) and a minimum of 30 hours of employability skills instruction. The students' employment is under the supervision of W.E.C.E.P. teacher-coordinators and employers. Students receive all State required courses necessary for graduation. The W.E.C.E.P. program is planned so that the students' individual academic achievement potential is recognized.

IV. Program Organization

The Vocational-Technical Education Service, Michigan Department of Education requires that W.E.C.E.P. programs in local districts meet the following criteria:

A. Eligibility. Any student aged 14 or 15 years, whom authoritative local school personnel identify as being able to benefit from the program, shall be eligible to participate.

B. Credits. Students shall receive school credits for both in-school related instruction and on-the-job experience.

C. Size. Each program unit shall consist of 12 to 25 students to one W.E.C.E.P. teacher-coordinator.

D. Instructional Schedule. W.E.C.E.P. students will spend a minimum of four periods daily in classroom instruction including one period of 180 hours of instruction devoted to job-related and employability skill instruction, safety and career exploration. Each student will have a minimum of 20 hours of career exploration utilizing the Michigan Occupational Information System (MOIS) and have a minimum of 30 hours of instruction in employability skills training. The employability skills training will equal or exceed the employability skills performance objectives adopted, as part of Michigan Vocational-Technical Service programs. Each local district submitting a letter of application to operate a W.E.C.E.P. program will furnish to the Vocational-Technical Education Service a course outline for the related class.

E. W.E.C.E.P. Teacher-Coordinator. Each program unit shall be under the supervision of a school official to be designated for the purpose of the program as a W.E.C.E.P. teacher-coordinator, who shall generally supervise the program and coordinate the work and education aspects of the program and make regularly scheduled visits to the work stations.

F. Written W.E.C.E.P. Training Agreement. No student shall participate in the program until there has been made a written E.E.C.E.P. training agreement signed by the W.E.C.E.P. teacher-coordinator, the employer and the student. The agreement shall also be signed or otherwise consented to by the student's parent or guardian. The W.E.C.E.P. training agreement will detail job tasks and related in-school instruction. A sample W.E.C.E.P. training agreement will be submitted annually by the local district to the Vocational-Technical Education Service.

G. Provision for Health and Well-Being. Employment under W.E.C.E.P. will not interfere with the schooling of the minors or with their health and well-being.

H. Records and Reports. The names and addresses of each school and the names and addresses of each employer enrolling work experience and career exploration program students and the number of enrollees in each unit shall be kept at the Vocational-Technical Education Service's office. A copy of the written W.E.C.E.P. training agreement for each student participating in the program shall be kept in the local educational office. The records required (for this paragraph) shall be kept for a period of three years from the date of enrollment in the program and shall be made available for inspection or transcription to the representatives of the Administrator of the Wage and Hour Division. Each school district operating a W.E.C.E.P. program shall submit an annual evaluative report by June 30th, which details the results of the W.E.C.E.P. program in terms of attendance and tardiness patterns, grade point average trends and dropout statistics of the enrollees. Based on a favorable state agency evaluation, a local district will be approved on an annual basis to operate a W.E.C.E.P. program. Under no circumstances can a local district operate a W.E.C.E.P. program without first obtaining written state agency approval for the program.

I. Approved Occupations. Employment of minors enrolled in a W.E.C.E.P. program approved pursuant to the requirements of this section shall be permitted in all occupations except the following:

1. Manufacturing and mining.

2. Occupations declared to be hazardous for the employment of minors between 16 and 18 years of age in Subpart E of Part 570 Child Labor Regulations, Orders and Statements of Interpretation of the Federal Fair Labor Standards Act, and occupations in agriculture declared to be hazardous for employment of minors below the age of 16 in Subpart E-1 of this part.

3. Occupations other than those permitted under sections 570.33 and 570.34 except upon approval of a variation in individual cases or classes of cases by the Administrator of the Wage and Hour Division after notice to interested persons and opportunity to be heard.

Employment of minors enrolled in a W.E.C.E.P. program approved pursuant to the requirements of this section shall be confined to not more than 23 hours in any week when school is in session and not more than three hours in any day when school is in session, any portion of which may be during school hours.

Employment of W.E.C.E.P. participants must not have the effect of displacing a worker in the establishment of the employer. Participants in W.E.C.E.P. must be paid according to the statutory minimum wage provision of the Fair Labor Standards Act.

V. Approval of Local Programs

Local school districts desiring approval to operate a W.E.C.E.P. program must submit an annual letter of application by June 30th to the

Michigan Department of Education
Vocational-Technical Education Service
Secondary Unit
Box 30009
Lansing, MI 48909
(517) 373-3365

VOCATIONAL WORK-STUDY

Definition and Purpose

The vocational work-study program is for those students who are in need of earnings from employment in order to commence or continue their vocational education programs.

Administration

The work-study program shall be administered by local educational agencies and made available, to the extent of available funds, to all qualified youth, in the area served by such agencies, who meet requirements.

Eligible Students

Employment under the work-study program shall be furnished only to a student who (a) has been accepted for enrollment or, if already enrolled, is in good standing and in full time attendance as a full-time student in a vocational education program which meets the standards of the state board and of the local educational agency and the requirements of the state plan, (b) is in need of the earnings from such employment to commence or continue a vocational education program, and (c) is at least 15 years of age and less than 21 years of age at the date of commencement of employment and is capable in the opinion of the appropriate school authorities of maintaining good standing in a school program while employed under the work-study program.

Limitation of Hours and Compensation of Employment

No student shall be employed under a vocational work-study program for more than 20 hours in any week in which classes in which the student is enrolled are in session. Summer employment shall not exceed 40 hours per week.

Employers

Employment under work-study programs shall be for the local educational agency or for some other public agency or institution, federal, state, or local and work so performed shall be adequately supervised and coordinated and shall not supplant present employees of such agency or institution who ordinarily perform such work. In those instances where employment under work-study programs is for a federal agency or institution, the written arrangement between the local educational agency and the federal agency or institution shall state that students so employed are not federal employees for any purpose.

Amounts Spent for Employment

In each fiscal year during which the work-study program remains in effect, the local educational agency shall expend for employment of its students an amount in state and/or local funds that is not less than the average annual expenditure for work-study programs of a similar nature during the three fiscal years preceding in which the supplementary plan provisons for its work study program are approved.

Applications, Priorities, and Approval

Work-study programs shall be approved on an individual basis by the state board and shall be consistent with the policies and procedures set forth.

Applications by Local Educational Agencies

Local educational agencies shall submit project proposals to the state board staff for approval in a manner similar to other vocational education programs.

Priority of Projects

Work-study programs will be provided, insofar as financial resources are available, for the undertaking of such programs in the order determined by the application of criteria for determining relative priority of projects which shall include preference for local educational agencies serving communities having substantial numbers of dropouts and unemployed youths and may include other relevant factors such as the extent to which the local educational agencies are using guidance and counseling and other related services designed to achieve the purposes of the work-study program.

MECHANICAL DRAFTING OCCUPATIONS
JOB TITLES

D.O.T.	TITLE
017.281-018	Assistant Drafter
033.281-014	Electronic Drafter
017.261-018	Detailer
017.281-034	Technical Illustrator
017.281-010	Auto Design Detailer
007.161-181	Drafter
007.261-014	Casting Drafter
007.281-010	Mechanical Drafter
007.261-022	Tool Detailer

DUTY/TASK - JOB MATRIX

JOB TITLES DUTY/TASK NUMBERS	Assistant Drafter	Electronic Drafter	Detailer	Tech Illustrator	Auto Design	Drafter	Casting Drafter	Mechanical Drafter	Tool Drafter							
L - 1							X									
2							X									
3	X		X			X	X	X	X							
4	X		X			X	X	X	X							
5	X		X			X	X	X	X							
6							X									
7							X									
8							X									
9	X		X			X	X	X	X							
M - 1	X		X			X	X	X	X							
2	X		X			X		X	X							
3	X		X			X		X	X							
4	X		X			X		X	X							
5	X		X			X	X	X	X							
6	X		X			X	X	X	X							
7	X		X			X		X	X							
8	X		X			X		X	X							
9	X		X			X		X	X							
10	X		X			X		X	X							

DUTY/TASK NUMBERS

JOB TITLES	Assistant Drafter	Electronic Drafter	Detailer	Tech Illustrator	Auto Design	Drafter	Casting Drafter	Mechanical Drafter	Tool Drafter
M - 11	X		X			X		X	X
12	X		X			X		X	X
13	X		X			X		X	X
14	X		X			X		X	X
N - 1	X		X			X		X	X
2	X		X			X		X	X
3	X		X			X		X	X
4	X		X			X		X	X
O - 1					X				
2					X				
3					X				
4					X				
5					X				
6					X				
7					X				
8					X				
9					X				
10					X				
11					X				

DUTY/TASK – JOB MATRIX

3

JOB TITLES	Assistant Drafter	Electronic Drafter	Detailer	Tech Illustrator	Auto Design	Drafter	Casting Drafter	Mechanical Drafter	Tool Drafter							
O - 12					X											
13					X											
14					X											
15					X											
16					X											
17					X											
P - 1					X											
2					X											
3					X											
4					X											
5					X											
6					X											
7					X											
Q - 1								X	X							
2								X	X							
3								X	X							
4								X	X							
5								X	X							
6								X								

DUTY/TASK NUMBERS

JOB TITLES	Assistant Drafter	Electronic Drafter	Detailer	Tech Illustrator	Auto Design	Drafter	Casting Drafter	Mechanical Drafter	Tool Drafter							
Q - 7								X								
8								X								
R - 1	X	X	X	X		X										
2				X												
3				X												
4				X												
5				X												
6				X												
7				X												
8				X												
9				X												
10	X		X	X	X											
11	X		X	X	X											
12				X												
13				X												
14				X												
15				X												
16				X												
17				X												

DUTY/TASK - JOB MATRIX

JOB TITLES	Assistant Drafter	Electronic Drafter	Detailer	Tech Illustrator	Auto Design	Drafter	Casting Drafter	Mechanical Drafter	Tool Drafter						
R - 18				X											
19				X											
20				X											
21				X											
22				X											
23				X											
24				X											
25				X											
26				X											
27				X											
28				X											
29				X											
30				X											
S - 1		X													
2		X													
3		X													
4		X													
5		X													
6		X													

JOB TITLES JOB/TASK NUMBERS	Assistant Drafter	Electronic Drafter	Detailer	Tech Illustrator	Auto Design	Drafter	Casting Drafter	Mechanical Drafter	Tool Drafter							
S - 7		X														
8		X														
9		X														
10		X														

TASK LIST FOR
MECHANICAL DRAFTING

A. PREPARING TO DRAW

1. Adjust drafting table using available knobs or levers to achieve maximum comfort and efficiency reducing drafting fatigue.
2. Clean drafting tools using mild liquid soap, water, and towels to minimize smudges on work.
3. Select drafting (media) using knowledge of end product to develop an acceptable drawing.
4. Select proper sheet size using size description and number of views required to produce drawing.
5. Fasten paper using tape and parallel edge to secure paper properly in preparation for drawing.
6. Select drafting pencils using acquired knowledge to construct necessary lines required to complete a drawing.
7. Select leads using range of available products to match proper lead to drawing media.
8. Point leads using mechanical lead pointer or sandpaper to shape lead for drawing conditions to produce acceptable line weights.

B. DEMONSTRATING BASIC DRAWING

1. Draw guidelines using parallel edge and lettering guides to draw standard lines required to develop a drawing.
2. Draw break lines using parallel edge, triangle, and reference to produce break lines required to develop a drawing.
3. Erase lines using eraser, erasing shield, and brush to correct errors in a drawing.
4. Construct specified lines to proper line quality by using assorted drafting pencils and reference material to develop a drawing.
5. Measure line segments using a fractional scale to determine the dimensions required to develop a drawing.
6. Draw line segments using a fraction scale to measure the lines required to develop a drawing.
7. Measure line segments using a decimal inch scale to determine the dimensions required to develop a drawing.
8. Draw line segments using a decimal scale to measure the lines required to develop a drawing.

B. DEMONSTRATING BASIC DRAWING (con't)

9. Measure line segments using a metric scale to determine the dimensions required to develop a drawing.

10. Draw line segments using a metric scale to measure the lines required to develop a drawing.

11. Draw horizontal lines using a straight edge to produce the lines required to develop a drawing.

12. Draw vertical lines using a triangle to produce the required lines for development of a drawing.

13. Draw angular lines using 45 degree and 30 degree and 60 degree triangles to produce the required lines to develop a drawing.

14. Draw parallel lines using a triangle and a straight edge to produce the lines required to develop a drawing.

15. Draw perpendicular lines using a triangle and a straight edge to produce the lines required to develop a drawing.

16. Draw circles using a bow compass to produce the required circles to develop a drawing.

17. Construct arrowheads using drafting pencils required to develop a drawing.

18. Draw various line weights using parallel edge, triangles, and compass to produce quality line work required to develop a drawing.

19. Construct gothic lettering using a work sheet with properly spaced guide lines to letter a drawing.

20. Construct a drawing using drafting pencils to develop a clear, neat drawing.

C. DEVELOPING GEOMETRIC CONSTRUCTION

1. Measure angles using a protractor to determine angle dimension required to develop a drawing.

2. Lay out given angles using drafting tools to obtain 15 degree, 30 degree, 45 degree, 60 degree, and 75 degree angles required to develop a drawing.

3. Set compass using scale, paper, and dividers to accurately draw arcs and circles required to develop a drawing.

4. Draw curved lines using an irregular curve to produce the required lines to develop a drawing.

C. DEVELOPING GEOMETRIC CONSTRUCTION (con't)

5. Draw radii using circle templates to construct radii required to develop a drawing.

6. Construct a tangent line using drafting tools to generate lines tangent to given arcs required to develop a drawing.

7. Bisect a line using drafting tools and basic geometric construction technique to divide a line required to develop a drawing.

8. Divide given lines using drafting tools, into specified number of equal parts required to develop a drawing.

9. Bisect an arc using drafting tools and basic geometric construction technique to divide an arc required to develop a drawing.

10. Bisect an angle using drafting tools and basic geometric construction technique to divide an angle required to develop a drawing.

11. Construct a regular hexagon using drafting tools as required to develop a drawing.

12. Construct a pentagon using drafting tools as required to develop a drawing.

13. Construct an octagon using drafting tools as required to develop a drawing.

14. Construct a circle using drafting tools to draw circle through 3 (three) points not in a straight line required to develop a drawing.

15. Construct arcs tangent to given angles using drafting tools as required to develop a drawing.

16. Construct arcs tangent to given arcs using drafting tools as required to develop a drawing.

17. Construct an ellipse using drafting tools, as required to develop a drawing.

D. DEVELOPING PICTORIAL DRAWING TECHNIQUES

1. Sketch a pictorial drawing using a problem sheet showing parts drawn orthographically to produce an isometric drawing.

2. Construct an isometric drawing using an assigned orthographic drawing to develop a completed drawing.

3. Construct oblique drawing using assigned problems to develop pictorial drawings.

E. DEVELOPING ORTHOGRAPHIC PROJECTION TECHNIQUES

1. Prepare a straight line sketch using an assigned problem as required to develop a drawing.
2. Prepare a circle sketch using an assigned problem as required to develop a drawing.
3. Prepare curved line sketch using an assigned problem as required to develop a drawing.
4. Sketch orthographic views using an assigned pictorial drawing to develop the views as required to develop a drawing.
5. Draw orthographic views using drafting tools and an assigned pictorial drawing to construct the views required to develop a drawing.
6. Construct the third view using an assigned two-view drawing to produce a completed three-view drawing.

F. DEMONSTRATING DIMENSIONING SKILLS

1. Place overall dimensions using an assigned problem sheet to produce overall dimensions as required to dimension a drawing.
2. Place location dimensions using an assigned problem with internal diameters to provide dimensions as required to dimension a drawing.
3. Place size dimensions using an assigned problem with internal diameters to provide dimensions as required to dimension a drawing.
4. Place size dimensions using an assigned problem with various radii to produce dimensions as required to dimension a drawing.
5. Place dimensions using an assigned problem with inclined planes to produce dimensions as required to dimension a drawing.
6. Place size dimensions using an assigned problem with various tapers to denote size as required to dimension a drawing.
7. Place size dimensions using an assigned problem with various examples of chamfers to denote sizes as required to dimension a drawing.
8. Place size dimensions using an assigned problem with examples of keyways to denote sizes as required to dimension a drawing.
9. Place size dimensions using an assigned problem with examples of knurled handles to denote sizes as required to dimension a drawing.
10. Apply decimal dimensioning system using drafting tools and an assigned problem to produce dimensions as required to dimension a drawing.

F. DEMONSTRATING DIMENSIONING SKILLS (con't)

11. Apply metric dimensioning system using drafting tools and an assigned problem to produce dimensions required to dimension a drawing.

12. Apply conventional dimensioning system using drafting tools and an assigned problem to produce dimensions required to dimension a drawing.

13. Apply tabular dimensioning practices using an assigned problem with similar parts to denote sizes as required to dimension a drawing.

14. Apply datum line dimensioning practices using an assigned problem to denote sizes as required to dimension a drawing.

15. Apply plus-minus dimensions using an assigned problem needing tolerances, to denote sizes as required to dimension a drawing.

16. Apply limits dimensioning using an assigned problem converting from plus-minus tolerances to denote sizes as required to dimension a drawing.

17. Apply clearance fit tolerances using an assigned problem including hole and shaft examples to denote specifications as required to dimension a drawing.

18. Apply interference fit tolerance using an assigned problem with hole and shaft example to denote specification dimensioning skills as required to dimension a drawing.

19. Apply transitional fit tolerance using an assigned problem with hole and shaft to denote specifications as required to dimension a drawing.

20. Apply basic hole and shaft systems using drafting tools and an assigned problem with various hole and shaft combinations to denote sizes as required to dimension a drawing.

21. Add general notes using drafting tools and a problem sheet showing cast parts, sheetmetal parts and machine parts to present technical information as required to develop a drawing.

22. Add local notes using a problem sheet with a variety of hole conditions to produce dimensions as required to develop a drawing.

23. Apply sub-title information using a drawing of machine part, cast part and forged part to provide identifying information required to complete the sub-title.

24. Apply finish symbols using a drawing of a cast part to identify machined surfaces as required to develop a drawing.

25. Apply surface control symbols using a drawing of a cast part to identify machined surfaces as required to develop a drawing.

26. Apply geometric dimensioning symbols using a problem sheet to identify part features and symbols as required to develop a drawing.

G. DEVELOPING SECTIONAL VIEWS

1. Identify sectional views using a problem sheet to recognize usage of various sections required in developing a drawing.
2. Draw sectional views using a problem sheet to illustrate portions of the job required to develop a drawing.
3. Construct a full section using assigned problem to develop a sectional view drawing required in clarification of detail and specification.
4. Construct a half section using an assigned problem to develop a sectional view drawing required in clarification of detail and specification.
5. Construct an offset section using assigned problem to develop a sectional view drawing required in clarification of detail and specification.
6. Construct a removed section using an assigned problem to develop a sectional view drawing required in clarification of detail and specification.
7. Construct a revolved section using an assigned problem to develop a sectional view drawing required in clarification of detail and specification.
8. Construct a broken-out section using an assigned problem to develop a sectional view drawing required in clarification of detail and specification.
9. Construct an aligned section using assigned problem to develop a sectional view drawing required in clarification of detail and specification.
10. Construct ribs in section using assigned problem to develop a sectional view drawing required in clarification of detail and specification.
11. Construct webs in section using assigned problem to develop a sectional view drawing required in clarification of detail and specification.
12. Construct spokes in section using assigned problem to develop a sectional view drawing required in clarification of detail and specification.
13. Construct machined holes in section using assigned problems to develop a sectional view drawing required in clarification of detail and specification.

H. DEVELOPING AUXILIARY VIEWS

1. Identify a normal surface, using an assigned problem to utilize visualization skills required to develop a drawing.
2. Identify an inclined surface using an assigned problem to utilize visualization skills required to develop a drawing

H. DEVELOPING AUXILIARY VIEWS (con't)

3. Identify an oblique surface using an assigned problem to utilize visualization skills required to develop a drawing.
4. Identify auxiliary views using an assigned problem to recognize various usage conditions as required to develop a drawing.
5. Draw auxiliary views using problem sheet to illustrate the inclined surface required to develop a drawing.
6. Construct an oblique surface auxiliary view using assigned problem to develop an auxiliary view drawing required to develop a drawing.

I. DEMONSTRATING SKILLS IN APPLYING THREAD AND FASTENING TECHNIQUES

1. Identify common fasteners using assigned problems to recognize fasteners required for the job.
2. Identify screw thread terms using assigned problem to recognize and interpret information required in correct specifications for the job.
3. Identify thread symbolism using assigned problem to recognize and interpret symbols required in developing a drawing.
4. Draw a simplified thread symbol using assigned problem to illustrate the symbol required in developing a drawing.

J. IDENTIFYING SHOP PROCESSES

1. Identify machining operations using assigned problem to construct plans and specifications that are required to develop a drawing.
2. Identify manufacturing processes using an assigned problem to understand processes required to develop a drawing.
3. Construct standard structural shapes using an assigned problem to recognize and apply the correct selections for a job.
4. Identify the non-ferrous materials using an assigned problem as required to develop a drawing.
5. Identify the heat treating processes using an assigned problem as required to develop a drawing.

K. DEMONSTRATING JOB ENTRY SKILLS

1. Select drafting media using acquired knowledge to prepare a project required to develop a drawing of proper size and capacity.
2. Letter appropriate systems using reference and knowledge to utilize the style required resulting in a completed drawing.

K. DEMONSTRATING JOB ENTRY SKILLS (con't)

3. Draw arrowheads using pencil or pen to denote dimension and note reference to develop a drawing.
4. Complete title block using standardized print paper to provide identifying information as required in the title block.
5. Make revisions using an assigned problem to correct a drawing.
6. Apply change information using a drawing change block to indicate changes required to correct a drawing.
7. Reproduce a drawing using a blueprint machine and blueprint paper to make a copy of the drawing.
8. Apply reference information using an assigned problem to develop an ability to use catalogs and standards required in selection of materials.
9. Fold prints using an assigned problem or transmit completed material.
10. Identify symmetrically opposite parts using assigned problem to develop a drawing.
11. Apply symmetrical opposite part subtitle using assigned problem to illustrate a drawing.
12. Calculate weight using an assigned problem sheet to determine weight of geometric solids as required to develop a drawing.
13. Calculate volumes using an assigned problem to determine volumes of basic geometric solids as required to develop a drawing.
14. Solve unknown angles using Pythagorean Theorem to determine unknown angles as required to develop a drawing.
15. Construct assembly drawing using assigned problem to understand procedures required in developing drawings and specifications.
16. Construct details on assembly drawings using assigned problem to understand details required in developing drawings and specifications.
17. Construct an ink drawing using an assigned problem as required to complete a drawing.

SPECIFIC TASKS FOR: MECHANICAL DRAFTING OCCUPATIONS

L. DEVELOPING CASTING DRAWING SKILLS

1. Measure actual size using a shrink rule to determine part size as required to develop a drawing.
2. Identify need for a cored hole on a cast part drawing using an assigned problem as required to develop a drawing.

L. DEVELOPING CASTING DRAWING SKILLS (con't)

3. Apply radii features using an assigned problem to detail a cast part as required to develop a drawing.

4. Project runouts using an assigned problem to detail a cast part as required to develop a drawing.

5. Identify the sand cast process using an assigned problem as required to develop a drawing.

6. Identify the centrifical casting process using an assigned problem as required to develop a drawing.

7. Identify precision investment casting process using an assigned problem as required to develop a drawing.

8. Identify the lost wax casting process using an assigned problem as required to develop a drawing.

9. Apply notes using an assigned problem to specify information critical to the casting process as required to develop a drawing.

M. DEVELOPING DETAILING DRAWING SKILLS

1. Identify standard purchase parts using an assigned problem sheet specifying various parts used on fixtures as required to develop drawing.

2. Identify standard clamps using an assigned problem sheet specifying clamps used on fixtures as required to develop a drawing.

3. Identify various gauges using an assigned problem sheet specifying gauges on fixtures as required to develop a drawing.

4. Identify basic welding symbols using an assigned problem sheet specifying various welds as required to develop a drawing.

5. Trace a detail drawing of a specified part using an assigned assembly drawing as required to develop a drawing.

6. Construct a detail drawing of a cast part using an assigned problem as required to develop a drawing.

7. Construct a detail drawing of a machined part using an assigned problem as required to develop a drawing.

8. Construct a detail drawing of a forged part using an assigned problem to develop a drawing.

9. Construct a detail drawing of a welded component using an assigned problem sheet of a welded construction assembly to develop a drawing.

10. Construct a detail drawing of a metal stamping using an assigned problem as required to develop a drawing.

M. DEVELOPING DETAILING DRAWING SKILLS (con't)

11. Construct a detail drawing of parts from a jig assembly drawing using an assigned problem as required to develop a drawing.

12. Construct a detail drawing using an assigned problem of a drilling fixture assembly as required to develop a drawing.

13. Construct a detail drawing using an assigned problem sheet of a checking fixture assembly as required to develop a drawing.

14. Construct detail drawing using an assigned problem sheet of a holding fixture for milling operations as required to develop a drawing.

N. DEVELOPING ASSEMBLY DRAWING SKILLS

1. Construct a working assembly drawing using a worksheet to develop a drawing.

2. Construct an outline assembly drawing using a worksheet to develop a drawing.

3. Construct a sectional assembly drawing using an assigned problem as required to develop a drawing.

4. Construct a sub-assembly drawing using an assigned problem as required to develop a drawing.

O. DEVELOPING DESCRIPTIVE GEOMETRY SKILLS

1. Draw true length lines using oblique lines as required to develop a drawing.

2. Draw the edge view using an oblique plane as required to develop a drawing.

3. Draw the true angle using two planes to determine an angle as required to develop a drawing.

4. Draw the end view using oblique line to produce an end view as required to develop a drawing.

5. Measure the minimum distance using a point and a plane to determine a dimension as required to develop a drawing.

6. Measure the minimum distance using a point and a line as required to develop a drawing.

7. Draw the true view using an oblique plane to produce a true view as required to develop a drawing.

8. Develop the intersection line using a plane and a prism to find the intersection data as required to develop a drawing.

O. DEVELOPING DESCRIPTIVE GEOMETRY SKILLS (con't)

9. Develop the intersection line using a plane and pyramid to find the intersection line data as required to develop a drawing.

10. Develop the intersection line using two prisms to find the intersection line data as required to develop a drawing.

11. Develop the intersection line using two cylinders to find the intersection line data as required to develop a drawing.

12. Develop the intersection line using two pyramids to find the intersection line data as required to develop a drawing.

13. Develop the intersection line using two cones to find the intersection line data as required to develop a drawing.

14. Construct the blank pattern using two views of a prism to find the pattern data as required to develop a drawing.

15. Construct the blank pattern using two views of a cylinder to find the pattern data as required to develop a drawing.

16. Construct the blank pattern using two views of a pyramid to find the pattern data as required to develop a drawing.

17. Construct the blank pattern using two views of a cone to find the pattern data as required to develop a drawing.

P. DEVELOPING BODY DRAFTING SKILLS

1. Construct a body inch line section using an assigned sheetmetal body drawing as required to develop a drawing.

2. Construct a true radial section using an assigned sheetmetal body drawing as required to develop a drawing.

3. Construct a removed body section using drafting tools and assigned sheetmetal body drawing to make a body section.

4. Construct a revolved body section using drafting tools and assigned sheetmetal body drawing to make a body section.

5. Construct a telltale section using an assigned sheetmetal body drawing as required to develop a drawing.

6. Construct a third view using an assigned problem that includes a body drawing on inch grid as required to develop a drawing.

7. Construct a third view using an assigned problem that includes a body drawing on metric grid, as required to develop a drawing.

R. DEVELOPING TECHNICAL ILLUSTRATING SKILLS (con't)

11. Construct an isometric ellipse using a protractor as required to develop a drawing.

12. Draw a perspective view using an assigned problem as required to develop a pictorial drawing.

13. Draw a perspective ellipse using perspective templates as required to develop a drawing.

14. Construct a dimetric drawing using an assigned problem as required to develop a drawing.

15. Construct a trimetric pictorial using an assigned problem as required to produce a pictorial.

16. Draw a schematic pictorial view using an assigned problem as required to develop a pictorial drawing.

17. Prepare an illustration drawing using a sketch as required to develop a layout.

18. Prepare an illustration drawing using photoprints as required to develop an illustration drawing.

19. Prepare an illustration drawing using a blueprint as required to develop a pictorial drawing.

20. Prepare an illustration drawing using designs as required to develop a pictorial drawing.

21. Prepare an illustration drawing using mock-ups as required to develop a pictorial drawing.

22. Prepare an illustration drawing using note as required to develop a layout.

23. Construct a plotted grid perspective using an assigned problem as required to develop a drawing.

24. Construct a measured perspective illustration using an assigned problem as required to develop a drawing.

25. Construct an exploded assembly drawing using an assigned problem as required to develop a drawing.

26. Construct a paste-up drawing using an assigned problem as required to develop a layout.

27. Construct a water color gray-tone drawing using an assigned problem as required to develop a drawing.

28. Construct a color drawing using an assigned problem as required to develop a rendering.

Q. DEVELOPING CAM AND GEAR LAYOUT SKILLS

1. Construct the layout for a uniform cam motion using an assigned problem as required to develop a drawing.
2. Construct the layout for a harmonic cam motion using an assigned problem as required to develop a drawing.
3. Construct the layout for a uniform accelerated cam motion using an assigned problem as required to develop a drawing.
4. Construct the layout for uniform accelerated and retarded cam motion using an assigned problem as required to develop a drawing.
5. Construct the layout for a drum cam using an assigned problem as required to develop a drawing.
6. Construct the layout for a spur gear using an assigned problem as required to develop a drawing.
7. Construct the layout for a bevel gear using an assigned problem as required to develop a drawing.
8. Construct the layout for a worn gear using an assigned problem as required to develop a drawing.

R. DEVELOPING TECHNICAL ILLUSTRATING SKILLS

1. Transfer rub-on letters using an assigned problem as required to properly letter a drawing.
2. Prepare a sketch using objects as required to develop a drawing.
3. Prepare a sketch using photographs as required to develop a drawing.
4. Prepare a sketch using blueprints as required to develop a drawing.
5. Select proper orthographic view using an assigned problem as required to develop a drawing.
6. Select the proper scale using an assigned problem as required to develop a sketch.
7. Construct an enlarged drawing using proportional dividers as required to develop a drawing.
8. Construct a reduced drawing using proportional dividers as required to develop a drawing.
9. Construct an isometric box drawing using an assigned problem as required to develop a drawing.
10. Draw an isometric ellipse using isometric templates as required to develop a drawing.

R. DEVELOPING TECHNICAL ILLUSTRATING SKILLS (con't)

29. Retouch photos using an assigned problem as required to correct defects.

30. Render an airbrush drawing using an assigned problem as required to develop a drawing.

S. DEVELOPING ELECTRONIC DRAWING SKILLS

1. Identify electronic device symbols using an assigned problem as required to properly identify components.

2. Construct electronic device symbols using an assigned problem as required to develop a drawing.

3. Construct a wiring diagram using an assigned problem to develop a drawing.

4. Construct an electronic equipment layout using an assigned problem as required to develop a drawing.

5. Construct a panel layout using an assigned problem as required to develop a drawing.

6. Construct a panel detail using an assigned problem as required to develop a drawing.

7. Construct a block diagram using an assigned problem as required. to develop a drawing.

8. Construct a printed circuit drawing using an assigned problem as required to develop a drawing.

9. Construct an industrial control drawing using an assigned problem as required to develop a drawing.

10. Construct integrated circuit cut and peel drawing using an assigned problem as required to develop a drawing.

T. USING EMPLOYABILITY SKILLS

1. Investigate employment information using sources of employment information to identify employment opportunities.

2. Identify job requirements using health, physical, legal, education, and other occupational information to determine the requirements of an occupation.

3. Acquire wage information using available resources to determine the approximate entry wages, general wage range, and significant fringe benefits for an occupation.

T. USING EMPLOYABILITY SKILLS (con't)

4. Identify significant non-wage job characteristics using available resources to determine shift requirements, union affiliation, apprenticeships, occupational hazards, characteristics of work environment and other significant job factors.

5. Explore employment opportunities using available resources to describe local, regional, and national employment opportunities for an occupation.

6. Analyze career ladder using available resources to describe job progression in an occupation.

7. Identify personal criteria with information about available alternatives using a decision-making situation and procedures and skills in decision-making to choose a job, further training or alternatives.

8. Prepare a resume using personal information to apply for a job.

9. Write a letter of application using personal notes to apply/inquire about a job.

10. Complete a job application using personal notes to apply for a job.

11. Demonstrate appropriate dress using a knowledge of job requirements to comply with standards of on-the-job dress and grooming.

12. Complete a job interview using communication and interpersonal skills to become employed.

13. Describe personal criteria using references to identify acceptable job offers.

14. Demonstrate interpersonal skills to achieve successful relationships with others.

15. Identify source of continuing education for an occupation using available resources to identify career ladder alternatives.

16. Describe job termination procedures using a knowledge of the occupational area to leave a particular job.

Duty: Preparing to Draw

Duty No. A

Task No. 1

Task: Adjust drafting table using available knobs or levers to achieve maximum comfort and efficiency reducing drafting fatigue.

Achievement Indicators: The learner: Yes No

1. Adjusted drafting table for proper lighting - ____ ____
2. Adjusted drafting table for maximum working efficiency - ____ ____
3. Adjusted stool height for comfort - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specification.

Tools and Equipment:

Resources:

Duty: Preparing to Draw

Duty No. A

Task No. 2

Task: Clean drafting tools using mild liquid soap, water, and towels to minimize smudges on work.

Achievement Indicators: The learner:

	Yes	No
1. Constructed clean drawings -	____	____
2. Used clean tools -	____	____
3. Used proper cleaners -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specifications.

Tools and Equipment:

Resources:

Duty: Preparing to Draw

Duty No. A

Task No. 3

Task: Select drafting (media) using knowledge of end product to develop an acceptable drawing.

Achievement Indicators: The learner:

	Yes	No
1. Drafting media was suitable for finished product -	____	____
2. Used proper drafting media to obtain finished product-	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specifications.

Tools and Equipment:

Resources:

Duty: Preparing to Draw

Duty No. A

Task No. 4

Task: Select proper sheet size using size description and number of views required to produce drawing.

Achievement Indicators: The learner: Yes No

1. Selected proper sheet size using size description and number of views required to produce drawing - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specifications.

Tools and Equipment:

Resources:

Duty: Preparing to Draw	**Duty No.** A **Task No.** 5

Task: Fasten paper using tape and parallel edge to secure paper properly in preparation for drawing.

Achievement Indicators: The learner:	Yes	No
1. Fastened paper parallel to straight edge -	____	____
2. Fastened paper securely -	____	____
3. Fastened paper smoothly for proper drawing -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specifications.

Tools and Equipment:	**Resources:**

Duty: Preparing to Draw

Duty No. A

Task No. 6

Task: Select drafting pencils using acquired knowledge to construct necessary lines required to complete a drawing.

Achievement Indicators: The learner:	Yes	No
1. Drew proper line quality -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specifications.

Tools and Equipment:

Resources:

Duty: Preparing to Draw	**Duty No.** A **Task No.** 7

Task: Select leads using range of available products to match proper lead to drawing media.

Achievement Indicators: The learner:

	Yes	No
1. Drew proper line quality -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specifications.

Tools and Equipment:	**Resources:**

Duty: Preparing to Draw

Duty No. A

Task No. 8

Task: Point leads using mechanical lead pointer or sandpaper to shape lead for drawing conditions to produce acceptable line weights.

Achievement Indicators: The learner:	Yes	No
1. Drew proper line weight -	____	____
2. Used correct point -	____	____
3. Used lead pointer correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specifications.

Tools and Equipment:

Resources:

Duty: Demonstrating Basic Drawing

Duty No. B

Task No. 1

Task: Draw guidelines using parallel edge and lettering guides to draw standard lines required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Made guide lines parallel -	____	____
2. Drew to specification size requirement -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specifications.

Tools and Equipment:

Resources:

Duty: Demonstrating Basic Drawing	**Duty No.** B **Task No.** 2

Task: Draw break lines using parallel edge, triangle, and reference to produce break lines required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Drew break lines correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specifications.

Tools and Equipment:

Resources:

Duty: Demonstrating Basic Drawing

Duty No. B

Task No. 3

Task: Erase lines using eraser, erasing shield, and brush to correct errors in a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Erased lines cleanly -	____	____
2. Made a clean drawing -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specifications.

Tools and Equipment:

Resources:

Duty: Demonstrating Basic Drawing

Duty No. B

Task No. 4

Task: Construct specified lines to proper line quality by using assorted drafting pencils and reference material to develop a drawing.

Achievement Indicators: The learner:	Yes	No
1. Correctly utilized alphabet of lines to produce appropriate lines -	____	____
2. Produced line quality correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Basic Drawing	**Duty No.** B **Task No.** 5

Task: Measure line segments using a fractional scale to determine the dimensions required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Measured line segments correctly with a fractional scale - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Basic Drawing	**Duty No.** B **Task No.** 6

Task: Draw line segments using a fraction scale to measure the lines required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Scaled measurements correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specifications.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Basic Drawing	**Duty No.** B **Task No.** 7

Task: Measure line segments using a decimal inch scale to determine the dimensions required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Measured line segments correctly with a decimal scale -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Basic Drawing	**Duty No.** B **Task No.** 8

Task: Draw line segments using a decimal scale to measure the lines required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Scaled measurements correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specifications.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Basic Drawing

Duty No. B

Task No. 9

Task: Measure line segments using a metric scale to determine the dimensions required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Measured line segments correctly using metric scale -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Basic Drawing	**Duty No.** B **Task No.** 10

Task: Draw line segments using a metric scale to measure the lines required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Scaled measurements correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specifications.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Basic Drawing	**Duty No.** B **Task No.** 11

Task: Draw horizontal lines using a straight edge to produce the lines required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Drew horizontal lines correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Basic Drawing	**Duty No.** B **Task No.** 12

Task: Draw vertical lines using a triangle to produce the required lines for development of a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Drew vertical lines correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

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Duty: Demonstrating Basic Drawing	**Duty No.** B **Task No.** 13

Task: Draw angular lines using 45 degree and 30 degree and 60 degree triangles to produce the required lines to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Drew angular lines correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Basic Drawing

Duty No. B

Task No. 14

Task: Draw parallel lines using a triangle and a straight edge to produce the lines required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Drew parallel lines correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Basic Drawing	**Duty No.** B **Task No.** 15

Task: Draw perpendicular lines using a triangle and a straight edge to produce the lines required to develop a drawing.

Achievement Indicators: The learner

	Yes	No
1. Drew perpendicular lines correctly -	_____	_____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Basic Drawing

Duty No. B

Task No. 16

Task: Draw circles using a bow compass to produce the required circles to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Drew circles correctly using a bow compass - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Basic Drawing	**Duty No.** B **Task No.** 17

Task: Construct arrowheads using drafting pencils required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed arrowheads correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Basic Drawing

Duty No. B

Task No. 18

Task: Draw various line weights using parallel edge, triangles, and compass to produce quality line work required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Made consistant line quality -	____	____
2. Drew proper line weight -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specifications.

Tools and Equipment:

Resources:

Duty: Demonstrating Basic Drawing

Duty No. B

Task No. 19

Task: Construct gothic lettering using a work sheet with properly spaced guide lines to letter a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed gothic lettering that was structurally correct - ____ ____
2. Constructed gothic lettering that was neat - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Basic Drawing	**Duty No.** B **Task No.** 20

Task: Construct a drawing using drafting pencils to develop a clear, neat drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed a drawing that was correct, clear and neat -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Geometric Construction

Duty No. C

Task No. 1

Task: Measure angles using a protractor to determine angle dimension required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Measured angles accurately - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Geometric Construction	**Duty No.** C **Task No.** 2

Task: Lay out given angles using drafting tools to obtain 15 degree, 30 degree, 45 degree, 60 degree, and 75 degree angles required to develop a drawing.

Achievement Indicators: The learner:	Yes	No
1. Drew given angles at correct angle size -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Geometric Construction

Duty No. C

Task No. 3

Task: Set compass using scale, paper, and dividers to accurately draw arcs and circles required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Drew arcs and circles correctly -	____	____
2. Used compass correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specifications.

Tools and Equipment:

Resources:

Duty: Developing Geometric Construction	**Duty No.** C **Task No.** 4

Task: Draw curved lines using an irregular curve to produce the required lines to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Drew curved lines correctly using an irregular curve -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Geometric Construction	**Duty No.** C **Task No.** 5

Task: Draw radii using circle templates to construct radii required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Drew radii correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Geometric Construction

Duty No. C

Task No. 6

Task: Construct a tangent line using drafting tools to generate lines tangent to given arcs required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed lines tangent to given arcs - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Geometric Construction	**Duty No.** C **Task No.** 7

Task: Bisect a line using drafting tools and basic geometric construction technique to divide a line required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Divided a line correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Geometric Construction

Duty No. C

Task No. 8

Task: Divide given lines using drafting tools, into specified number of equal parts required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Divided lines correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Geometric Construction

Duty No. C

Task No. 9

Task: Bisect an arc using drafting tools and basic geometric construction technique to divide an arc required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Divided the arc correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Geometric Construction

Duty No. C

Task No. 10

Task: Bisect an angle using drafting tools and basic geometric construction technique to divide an angle required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Bisected the angle correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Geometric Construction

Duty No. C

Task No. 11

Task: Construct a regular hexagon using drafting tools as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed hexagon correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Geometric Construction	**Duty No.** C **Task No.** 12

Task: Construct a pentagon using drafting tools as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed pentagon correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

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Duty: Developing Geometric Construction	**Duty No.** C **Task No.** 13

Task: Construct an octagon using drafting tools as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed octagon correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Geometric Construction	**Duty No.** C **Task No.** 14

Task: Construct a circle using drafting tools to draw a circle through 3 (three) points not in a straight line required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed a circle that passed through 3 non-colinear points -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Geometric Construction	**Duty No.** C **Task No.** 15

Task: Construct arcs tangent to given angles using drafting tools as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed tangent arcs correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Geometric Construction	**Duty No.** C **Task No.** 16

Task: Construct arcs tangent to given arcs using drafting tools as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed tangent arcs correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Geometric Construction	**Duty No.** C **Task No.** 17

Task: Construct an ellipse using drafting tools, as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed an ellipse correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Pictorial Drawing Techniques	**Duty No.** D **Task No.** 1

Task: Sketch a pictorial drawing using a problem sheet showing parts drawn orthographically to produce an isometric drawing.

Achievement Indicators: The learner:

	Yes	No
1. Sketched an isometric drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specifications.

Tools and Equipment:	**Resources:**

Duty: Developing Pictorial Drawing Techniques	**Duty No.** D **Task No.** 2

Task: Construct an isometric drawing using an assigned orthographic drawing to develop a completed drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed an isometric drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Pictorial Drawing Techniques	**Duty No.** D **Task No.** 3

Task: Construct oblique drawings using assigned problems to develop pictorial drawings.

Achievement Indicators: The learner:

	Yes	No
1. Constructed oblique drawings correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Orthographic Projection Techniques

Duty No. E

Task No. 1

Task: Prepare a straight line sketch using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Prepared straight line sketch correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Orthographic Projection Techniques	**Duty No.** E **Task No.** 2

Task: Prepare a circle sketch using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Prepared circle sketch correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Orthographic Projection Techniques	**Duty No.** E
	Task No. 3

Task: Prepare a curved line sketch using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Prepared curved line sketch correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Orthographic Projection Techniques	**Duty No.** E **Task No.** 4

Task: Sketch orthographic views using an assigned pictorial drawing to develop the views as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Sketched orthographic views correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Orthographic Projection Technique-

Duty No. E

Task No. 5

Task: Draw orthographic views using drafting tools and an assigned pictorial drawing to construct the views required to develop a drawing.

Achievement Indicators: The learner:	Yes	No
1. Constructed the orthographic views correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Orthographic Projection Techniques	**Duty No.** E **Task No.** 6

Task: Construct the third view using an assigned two-view drawing to produce a completed three-view drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed the third-view correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Dimensioning Skills	**Duty No.** F **Task No.** 1

Task: Place overall dimensions using an assigned problem sheet to produce overall dimensions as required to dimension a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Placed overall dimensions correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to textbook standards.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Dimensioning Skills

Duty No. F

Task No. 2

Task: Place location dimensions using an assigned problem with internal diameters to provide dimensions as required to dimension a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Placed location dimensions correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Dimensioning Skills	**Duty No.** F **Task No.** 3

Task: Place size dimensions using an assigned problem with internal diameters to provide dimensions as required to dimension a drawing.

Achievement Indicators: The learner: Yes No

1. Placed size dimensions correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Dimensioning Skills	**Duty No.** F **Task No.** 4

Task: Place size dimensions using an assigned problem with various radii to produce dimensions as required to dimension a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Placed size dimensions correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to textbook standards.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Dimensioning Skills	**Duty No.**	F
	Task No.	5

Task: Place dimensions using an assigned problem with inclined planes to produce dimensions as required to dimension a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Placed size dimensions correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to textbook standards.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Dimensioning Skills

Duty No. F

Task No. 6

Task: Place size dimensions using an assigned problem with various tapers to denote size as required to dimension a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Placed size dimensions correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Dimensioning Skills	**Duty No.** F **Task No.** 7

Task: Place size dimensions using an assigned problem with various examples of chamfers to denote sizes as required to dimension a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Placed size dimensions correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

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Duty: Demonstrating Dimensioning Skills	**Duty No.** F **Task No.** 8

Task: Place size dimensions using an assigned problem with examples of keyways to denote sizes as required to dimension a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Placed size dimensions correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Dimensioning Skills	**Duty No.** F **Task No.** 9

Task: Place size dimensions using an assigned problem with examples of knurled handles to denote sizes as required to dimension a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Placed size dimensions correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Dimensioning Skills	**Duty No.** F **Task No.** 10

Task: Apply decimal dimensioning system using drafting tools and an assigned problem to produce dimensions as required to dimension a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Applied decimal dimensions correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to textbook standards.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Dimensioning Skills	**Duty No.** F **Task No.** 11

Task: Apply metric dimensioning system using drafting tools and an assigned problem to produce dimensions required to dimension a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Applied metric dimensions correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Dimensioning Skills	**Duty No.** F **Task No.** 12

Task: Apply conventional dimensioning system using drafting tools and an assigned problem to produce dimensions required to dimension a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Applied conventional dimensions correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

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Duty: Demonstrating Dimensioning Skills

Duty No. F

Task No. 13

Task: Apply tabular dimensioning practices using an assigned problem with similar parts to denote sizes as required to dimension a drawing.

Achievement Indicators: The learner:	Yes	No
1. Applied tabular dimensions correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Dimensioning Skills

Duty No. F

Task No. 14

Task: Apply datum line dimensioning practices using an assigned problem to denote sizes as required to dimension a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Applied datum line dimensions correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Dimensioning Skills

Duty No. F

Task No. 15

Task: Apply plus-minus dimensions using an assigned problem needing tolerances, to denote sizes as required to dimension a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Applied plus-minus dimensions correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

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Duty: Demonstrating Dimensioning Skills	**Duty No.** F **Task No.** 16

Task: Apply limits dimensioning using an assigned problem converting from plus-minus tolerances to denote sizes as required to dimension a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Applied limits dimensions correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Dimensioning Skills	**Duty No.** F **Task No.** 17

Task: Apply clearance fit tolerances using an assigned problem including hole and shaft examples to denote specifications as required to dimension a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Applied clearance fit tolerances correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Dimensioning Skills

Duty No. F

Task No. 18

Task: Apply interference fit tolerance using an assigned problem with hole and shaft example to denote specification dimensioning skills as required to dimension a drawing.

Achievement Indicators: The learner:	Yes	No
1. Applied interference fit tolerance correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Dimensioning Skills

Duty No. F

Task No. 19

Task: Apply transitional fit tolerance using an assigned problem with hole and shaft to denote specifications as required to dimension a drawing.

Achievement Indicators: The learner:	Yes	No
1. Applied transitional fit tolerance correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Dimensioning Skills

Duty No. F

Task No. 20

Task: Apply basic hole and shaft systems using drafting tools and an assigned problem with various hole and shaft combinations to denote sizes as required to dimension a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Applied basic hole and shaft systems correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Dimensioning Skills	**Duty No.** F
	Task No. 21

Task: Add general notes using drafting tools and a problem sheet showing cast parts, sheetmetal parts and machine parts to present technical information as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Added general notes correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Dimensioning Skills

Duty No. F

Task No. 22

Task: Add local notes using a problem sheet with a variety of hole conditions to produce dimensions as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Added local notes correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Dimensioning Skills

Duty No. F

Task No. 23

Task: Apply sub-title information using a drawing of machine part, cast part and forged part to provide identifying information required to complete the sub-title.

Achievement Indicators: The learner:

	Yes	No
1. Applied sub-title information correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to textbook standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Dimensioning Skills

Duty No. F

Task No. 24

Task: Apply finish symbols using a drawing of a cast part to identify machined surfaces as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Applied finish symbols correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Dimensioning Skills

Duty No. F

Task No. 25

Task: Apply surface control symbols using a drawing of a cast part to identify machined surfaces as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Applied surface control symbols correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Dimensioning Skills

Duty No. F

Task No. 26

Task: Apply geometric dimensioning symbols using a problem sheet to identify part features and symbols as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Applied geometric dimensioning symbols correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Sectional Views

Duty No. G

Task No. 1

Task: Identify sectional views using a problem sheet to recognize usage of various sections required in developing a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Identified sectional views correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Sectional View

Duty No. G

Task No. 2

Task: Draw sectional views using a problem sheet to illustrate portions of the job required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Drew sectional views correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Sectional Views

Duty No. G

Task No. 3

Task: Construct a full section using assigned problem to develop a sectional view drawing required in clarification of detail and specification.

Achievement Indicators: The learner:

	Yes	No
1. Constructed a full section correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Sectional Views

Duty No. G

Task No. 4

Task: Construct a half section using an assigned problem to develop a sectional view drawing required in clarification of detail and specification.

Achievement Indicators: The learner:

	Yes	No
1. Constructed a half section correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Sectional Views

Duty No. G

Task No. 5

Task: Construct an offset section using assigned problem to develop a sectional view drawing required in clarification of detail and specification.

Achievement Indicators: The learner: Yes No

1. Constructed an offset section correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Sectional Views

Duty No. G

Task No. 6

Task: Construct a removed section using an assigned problem to develop a sectional view drawing required in clarification of detail and specification.

Achievement Indicators: The learner:

	Yes	No
1. Constructed a removed section correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Sectional Views

Duty No. G

Task No. 7

Task: Construct a revolved section using an assigned problem to develop a sectional view drawing required in clarification of detail and specification.

Achievement Indicators: The learner: Yes No

1. Constructed a revolved section correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Sectional Views

Duty No. G

Task No. 8

Task: Construct a broken-out section using an assigned problem to develop a sectional view drawing required in clarification of detail and specification.

Achievement indicators: The learner:

	Yes	No
1. Constructed a broken-out section correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Sectional Views	**Duty No.** G **Task No.** 9

Task: Construct an aligned section using assigned problem to develop a sectional view drawing required in clarification of detail and specification.

Achievement Indicators: The learner:	Yes	No
1. Constructed an aligned section correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

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Duty: Developing Sectional Views

Duty No. G

Task No. 10

Task: Construct ribs in section using assigned problem to develop a sectional view drawing required in clarification of detail and specification.

Achievement Indicators: The learner:	Yes	No
1. Constructed ribs in section drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Sectional Views

Duty No. G

Task No. 11

Task: Construct webs in section using assigned problem to develop a sectional view drawing required in clarification of detail and specification.

Achievement Indicators: The learner:

	Yes	No
1. Constructed webs in section drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Sectional Views

Duty No. G

Task No. 12

Task: Construct spokes in section using assigned problem to develop a sectional view drawing required in clarification of detail and specification.

Achievement Indicators: The learner:

	Yes	No
1. Constructed spokes in section drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Sectional Views

Duty No. G

Task No. 13

Task: Construct machined holes in section using assigned problem to develop a sectional view drawing required in clarification of detail and specification.

Achievement Indicators: The learner: Yes No

1. Constructed machined holes in section drawing correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Auxiliary Views	**Duty No.** H **Task No.** 1

Task: Identify a normal surface using an assigned problem to utilize visualization skills required to develop a drawing.

Achievement Indicators: The learner:	Yes	No
1. Identified a normal surface correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Auxiliary Views

Duty No. H

Task No. 2

Task: Identify an inclined surface using an assigned problem to utilize visualization skills required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Identified an inclined surface correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Auxiliary Views	**Duty No.** H **Task No.** 3

Task: Identify an oblique surface using an assigned problem to utilize visualization skills required to develop a drawing.

Achievement Indicators: The learner:	Yes	No
1. Identified an oblique surface correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Auxiliary Views	**Duty No.** H **Task No.** 4

Task: Identify auxiliary views using knowledge to recognize various usage conditions required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Identified auxiliary views correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Auxiliary Views

Duty No. H

Task No. 5

Task: Draw auxiliary views using problem sheet to illustrate the inclined surface required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Drew auxiliary views correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: *Developing Auxiliary Views*	**Duty No.** H **Task No.** 6

Task: Construct an oblique surface auxiliary view using assigned problem to develop an auxiliary view drawing required to develop a drawing.

Achievement Indicators: The learner:

The learner:	Yes	No
1. Constructed an oblique surface auxiliary view correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Skills in Applying Thread and Fastening Techniques

Duty No. I

Task No. 1

Task: Identify common fasteners using assigned problems to recognize fasteners required for the job.

Achievement Indicators: The learner:

	Yes	No
1. Identified common fasteners correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Skills in Applying Thread and Fastening Techniques	**Duty No.** I **Task No.** 2

Task: Identify screw thread terms using assigned problem to recognize and interpret information required in correct specifications for the job.

Achievement Indicators: The learner:

	Yes	No
1. Identified screw thread terms correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Skills in Applying Thread and Fastening Techniques	**Duty No.** I **Task No.** 3

Task: Identify thread symbolism using assigned problem to recognize and interpret symbols required in developing a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Identified thread symbols correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

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Duty: Demonstrating Skills in Applying Thread and Fastening Techniques

Duty No. I

Task No. 4

Task: Draw a simplified thread symbol using assigned problem to illustrate the symbol required in developing a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Drew a simplified thread symbol correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Identifying Shop Processes

Duty No. J

Task No. 1

Task: Identify machining operations using assigned problem to construct plans and specifications that are required to develop a drawing.

Achievement Indicators: The learner:	Yes	No
1. Identified machining operations correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Identifying Shop Processes

Duty No. J

Task No. 2

Task: Identify manufacturing processes using an assigned problem to understand processes required to develop a drawing.

Achievement Indicators: The learner:	Yes	No
1. Identified manufacturing processes correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Identifying Shop Processes	**Duty No.** J
	Task No. 3

Task: Construct standard structural shapes using an assigned problem to recognize and apply the correct selections for a job.

Achievement Indicators: The learner:

	Yes	No
1. Constructed standard structural shapes drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Identifying Shop Processes

Duty No. J

Task No. 4

Task: Identify the non-ferrous materials using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Identified materials correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Identifying Shop Processes

Duty No. J

Task No. 5

Task: Identify the heat treating processes using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Identified heat treating processes correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Job Entry Skills	**Duty No.** K **Task No.** 1

Task: Select drafting media using acquired knowledge to prepare a project required to develop a drawing of proper size and capacity.

Achievement Indicators: The learner:

	Yes	No
1. Selected drawing media correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Job Entry Skills	**Duty No.** K **Task No.** 2

Task: Letter appropriate systems using reference and knowledge to utilize the style required resulting in a completed drawing.

Achievement Indicators: The learner:

	Yes	No
1. Properly made letters to style required -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specifications.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Job Entry Skills

Duty No. K

Task No. 3

Task: Draw arrowheads using pencil or pen to denote dimension and note reference to develop a drawing.

Achievement Indicators: The learner:	Yes	No
1. Drew arrowheads correctly to shop standards -	____	____
2. Correctly denoted dimensions and note references on arrowheads -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specifications.

Tools and Equipment:

Resources:

Duty: Demonstrating Job Entry Skills	**Duty No.** K **Task No.** 4

Task: Complete title block using standardized print paper to provide identifying information as required in the title block.

Achievement Indicators: The learner:	Yes	No
1. Completed the title block correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Job Entry Skills	**Duty No.** K **Task No.** 5

Task: Make revisions using an assigned problem to correct a drawing.

Achievement Indicators: The learner: Yes No

1. Made revisions correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Job Entry Skills	**Duty No.** K **Task No.** 6

Task: Apply change information using a drawing change block to indicate changes required to correct a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Applied change information correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specifications.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Job Entry Skills	**Duty No.**	K
	Task No.	7

Task: Reproduce a drawing using a blueprint machine and blueprint paper to make a copy of the drawing.

Achievement Indicators: The learner:	Yes	No
1. Reproduced drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Job Entry Skills	**Duty No.** K
	Task No. 8

Task: Apply reference information using an assigned problem to develop an ability to use catalogs and standards required in selection of materials.

Achievement Indicators: The learner: Yes No

1. Applied necessary reference information correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Job Entry Skills

Duty No. K

Task No. 9

Task: Fold prints using an assigned problem to file or transmit completed material.

Achievement Indicators: The learner:

	Yes	No
1. Folded prints correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Job Entry Skills

Duty No. K

Task No. 10

Task: Identify symmetrically opposite parts using assigned problem to develop, a drawing.

Achievement Indicators: The learner: Yes No

1. Identified symmetrically opposite parts correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Job Entry Skills

Duty No. K

Task No. 11

Task: Apply symmetrical opposite part subtitle using assigned problem to illustrate a drawing.

Achievement Indicators: The learner: Yes No

1. Applied symmetrical opposite part subtitle correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Job Entry Skills	**Duty No.** K
	Task No. 12

Task: Calculate weight using an assigned problem sheet to determine weight of geometric solids as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Calculated the geometric solid weights correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Job Entry Skills

Duty No. K

Task No. 13

Task: Calculate volumes using an assigned problem to determine volumes of basic geometric solids as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Calculated volumes correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Job Entry Skills

Duty No. K

Task No. 14

Task: Solve unknown angles using Pythagorean Theorem to determine unknown angles as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Solved angles correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Job Entry Skills	**Duty No.** K **Task No.** 15

Task: Construct assembly drawing using assigned problem to understand procedures required in developing drawings and specifications.

Achievement Indicators: The learner: Yes No

1. Constructed assembly drawing correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Demonstrating Job Entry Skills

Duty No. K

Task No. 16

Task: Construct details on assembly drawings using assigned problem to understand details required in developing drawings and specifications.

Achievement Indicators: The learner:

	Yes	No
1. Constructed details from an assembly drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Demonstrating Job Entry Skills	**Duty No.** K **Task No.** 17

Task: Construct an ink drawing using an assigned problem as required to complete a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed an ink drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

SPECIFIC TASKS FOR:
MECHANICAL DRAFTING OCCUPATIONS

Duty: Developing Casting Drawing Skills

Duty No. L

Task No. 1

Task: Measure actual size using a shrink rule to determine part size as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Measured the actual part size accurately -	___	___

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Casting Drawing Skills

Duty No. L

Task No. 2

Task: Identify need for a cored hole on a cast part drawing using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Identified need for a cored hole correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Casting Drawing Skills	**Duty No.** L **Task No.** 3

Task: Apply radii features using an assigned problem to detail a cast part as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Applied radii features correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

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Duty: Developing Casting Drawing Skills

Duty No. L

Task No. 4

Task: Project runouts using an assigned problem to detail a cast part as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Projected runouts correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Casting Drawing Skills

Duty No. L

Task No. 5

Task: Identify the sand cast process using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Identified the sand casting process correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Casting Drawing Skills

Duty No. L

Task No. 6

Task: Identify the centrifical casting process using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Identified the centrifical casting process correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Casting Drawing Skills

Duty No. L

Task No. 7

Task: Identify precision investment casting process using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Identified precision investment casting correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Casting Drawing Skills	**Duty No.** L **Task No.** 8

Task: Identify the lost wax casting process using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Identified the lost wax casting process correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Casting Drawing Skills	**Duty No.** L **Task No.** 9

Task: Apply notes using an assigned problem to specify information critical to the casting process as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Applied critical notes of the casting process correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Detailing Drawing Skills

Duty No. M

Task No.

Task: Identify standard purchase parts using an assigned problem sheet specifying various parts used on fixtures as required to develop drawing.

Achievement Indicators: The learner: Yes No

1. Identified standard purchase parts correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Detailing Drawing Skills	**Duty No.** M **Task No.** 2

Task: Identify standard clamps using an assigned problem sheet specifying clamps used on fixtures as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Identified standard clamps correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Detailing Drawing Skills

Duty No. M

Task No. 3

Task: Identify various gauges using an assigned problem sheet specifying gauges on fixtures as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Identified various gauges correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Detailing Drawing Skills

Duty No. M

Task No. 4

Task: Identify basic welding symbols using an assigned problem sheet specifying various welds as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Identified basic welding symbols correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Detailing Drawing Skills	**Duty No.** M
	Task No. 5

Task: Trace a detail drawing of a specified part using an assigned assembly drawing as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Traced detail drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Detailing Drawing Skills	**Duty No.** M **Task No.** 6

Task: Construct a detail drawing of a cast part using an assigned problem as required to develop a drawing.

Achievement-Indicators: The learner:

	Yes	No
1. Constructed a detail drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

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Duty: Developing Detailing Drawing Skills

Duty No. M

Task No. 7

Task: Construct a detail drawing of a machine part using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed a detail drawing correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specifications.

Tools and Equipment:

Resources:

Duty: Developing Detailing Drawing Skills

Duty No. M

Task No. 8

Task: Construct a detail drawing of a forged part using an assigned problem to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed a detail drawing correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specifications.

Tools and Equipment:

Resources:

Duty: Developing Detailing Drawing Skills

Duty No. M

Task No. 9

Task: Construct a detail drawing of a welded component using an assigned problem sheet of a welded construction assembly to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed detail drawing correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specifications.

Tools and Equipment:

Resources:

Duty: Developing Detailing Drawing Skills	**Duty No.** M **Task No.** 10

Task: Construct a detail drawing of a metal stamping using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed a detail drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specifications.

Tools and Equipment:	**Resources:**

Duty: Developing Detailing Drawing Skills

Duty No. M

Task No. 11

Task: Construct a detail drawing of parts from a jig assembly drawing using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed a detail drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Detailing Drawing Skills

Duty No. M

Task No. 12

Task: Construct a detail drawing using an assigned problem of a drilling fixture assembly as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed detail drawing correctly - _____ _____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Detailing Drawing Skills

Duty No. M

Task No. 13

Task: Construct a detail drawing using an assigned problem sheet of a checking fixture assembly as required to develop a drawing.

Achievement Indicators: The learner:	Yes	No
1. Constructed detail drawing correctly	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Detailing Drawing Skills

Duty No. M

Task No. 14

Task: Construct detail drawing using an assigned problem sheet of a holding fixture for milling operations as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed detail drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Assembly Drawing Skills	**Duty No.** N **Task No.** 1

Task: Construct a working assembly drawing using a worksheet to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed assembly drawing correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed accoridng to industrial standards.

Tools and Equipment:	**Resources:**

201

Duty: Developing Assembly Drawing Skills

Duty No. N

Task No. 2

Task: Construct an outline assembly drawing using a worksheet to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed assembly drawing correctly.- ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Assembly Drawing Skills

Duty No. N

Task No. 3

Task: Construct a sectional assembly drawing using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed assembly drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Assembly Drawing Skills	**Duty No.** N **Task No.** 4

Task: Construct a sub-assembly drawing using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner:	Yes	No
1. Constructed a sub-assembly drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Descriptive Geometry Skills

Duty No. 0

Task No. 1

Task: Draw true length lines using oblique lines as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Drew true length lines correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Descriptive Geometry Skills

Duty No. 0

Task No. 2

Task: Draw the edge view using an oblique plane as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Drew edge view correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Descriptive Geometry Skills

Duty No. 0

Task No. 3

Task: Draw the true angle using two planes to determine an angle as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Drew true angle correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Descriptive Geometry Skills

Duty No. 0

Task No. 4

Task: Draw the end view using oblique line to produce an end view as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Drew end view correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Descriptive Geometry Skills	**Duty No.** 0 **Task No.** 5

Task: Measure the minimum distance using a point and a plane to determine a dimension as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Measured distance correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Descriptive Geometry Skills	**Duty No.** 0 **Task No.** 6

Task: Measure the minimum distance between a point and a line as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Measured distance correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Descriptive Geometry Skills	**Duty No.** 0 **Task No.** 7

Task: Draw the true view using an oblique plane to produce a true view as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Drew true view correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Descriptive Geometry Skills	**Duty No.** 0
	Task No. 8

Task: Develop the intersection line using a plane and a prism to find the intersection data as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Drew intersection line correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Descriptive Geometry Skills	**Duty No.** 0 **Task No.** 9

Task: Develop the intersection line using a plane and pyramid to find the intersection line data as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	NO
1. Drew intersection line correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

213

Duty: Developing Descriptive Geometry Skills

Duty No. 0

Task No. 10

Task: Develop the intersection line using two prisms to find the intersection line data as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Drew intersection line correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Descriptive Geometry Skills

Duty No. 0

Task No. 11

Task: Develop the intersection line using two cylinders to find the intersection line data as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Drew intersection line correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Descriptive Geometry Skills	**Duty No.** 0 **Task No.** 12

Task: Develop the intersection line using two pyramids to find the intersection line data as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Drew intersection line correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Descriptive Geometry Skills	**Duty No.** 0 **Task No.** 13

Task: Develop the intersection line using two cones to find the intersection line data as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Drew intersection line correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicator are performed according to industrial standards.

Tools and Equipment:

Resources:

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Duty: Developing Descriptive Geometry Skills	**Duty No.** 0 **Task No.** 14

Task: Construct the blank pattern using two views of a prism to find the pattern data as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed blank pattern correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Descriptive Geometry Skills	**Duty No.** 0 **Task No.** 15

Task: Construct the blank pattern using two views of a cylinder to find the pattern data as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed blank pattern correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Descriptive Geometry Skills

Duty No. 0

Task No. 16

Task: Construct the blank pattern using two views of a pyramid to find the pattern data as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed blank pattern correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Descriptive Geometry Skills	**Duty No.** 0 **Task No.** 17

Task: Construct the blank pattern using two views of a cone to find the pattern data as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed blank pattern correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Body Drafting Skills	**Duty No.** P **Task No.** 1

Task: Construct a body inch line section using an assigned sheetmetal body drawing as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed body inch line section correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Body Drafting Skills	**Duty No.** P
	Task No. 2

Task: Construct a true radial section using an assigned sheetmetal body drawing as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed true radial section correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Body Drafting Skills	**Duty No.** P **Task No.** 3

Task: Construct a removed body section using drafting tools and assigned sheetmetal body drawing to make a body section.

Achievement Indicators:

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Body Drafting Skills

Duty No. P

Task No. 4

Task: Construct a revolved body section using drafting tools and assigned sheetmetal body drawing to make a body section.

Achievement Indicators:

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Body Drafting Skills	**Duty No.** P **Task No.** 5

Task: Construct a telltale section using an assigned sheetmetal body drawing as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed telltale section correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Body Drafting Skills

Duty No. P

Task No. 6

Task: Construct a third view using an assigned problem that includes a body drawing on inch grid as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed third view correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Body Drafting Skills	**Duty No.** P **Task No.** 7

Task: Construct a third view using an assigned problem that includes a body drawing on metric grid, as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed a third view correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Cam and Gear Layout Skills	**Duty No.** Q **Task No.** 1

Task: Construct the layout for a uniform cam motion using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed the layout correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Cam and Gear Layout Skills	**Duty No.** Q
	Task No. 2

Task: Construct the layout for a harmonic cam motion using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed the layout correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Cam and Gear Layout Skills

Duty No. Q

Task No. 3

Task: Construct the layout fo· a uniform accelerated cam motion using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed the layout correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Cam and Gear Layout Skills

Duty No. Q

Task No. 4

Task: Construct the layout for uniform accelerated and retarded cam using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed the layout correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Cam and Gear Layout Skills

Duty No. Q

Task No. 5

Task: Construct the layout for a drum cam using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed the layout correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Cam and Gear Layout Skills	**Duty No.** Q **Task No.** 6

Task: Construct the layout for a spur gear using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed the layout correctly -	_____	_____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Cam and Gear Layout Skills

Duty No. Q

Task No.

Task: Construct the layout for a bevel gear using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed the layout correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Cam and Gear Layout Skills

Duty No. Q

Task No. 8

Task: Construct the layout for a worm gear using an assigned problem to develop a drawing.

Achievement Indicators: The learner:	Yes	No
1. Constructed the layout correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Technical Illustrating Skills

Duty No. R

Task No. 1

Task: Transfer rub-on letters using an assigned problem as required to properly letter a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Applied rub-on letters correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to textbook standards.

Tools and Equipment:

Resources:

Duty: Developing Technical Illustrating Skills	**Duty No.** R
	Task No. 2

Task: Prepare a sketch using objects as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Prepared sketch correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Technical Illustrating Skills	**Duty No.** R **Task No.** 3

Task: Prepare a sketch using photographs as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Prepared sketch correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Technical Illustrating Skills

Duty No. R

Task No. 4

Task: Prepare a sketch using blueprints as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Prepared sketch correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Technical Illustrating Skills

Duty No. R

Task No.

Task: Select proper orthographic views using an assigned problem as required to devel
a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Selected views correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Technical Illustrating Skills

Duty No. R

Task No. 6

Task: Select the proper scale using an assigned problem as required to develop a sketch.

Achievement Indicators: The learner: Yes No

1. Selected scale correctly - ____ ____

Criteria:
Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Technical Illustrating Skills

Duty No. R

Task No. 7

Task: Construct an enlarged drawing using proportional dividers as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed an enlarged drawing correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Technical Illustrating Skills	**Duty No.** R **Task No.** 8

Task: Construct a reduced drawing using proportional dividers as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed reduced drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Technical Illustrating Skills

Duty No. R

Task No. 9

Task: Construct an isometric box drawing using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed isometric box drawing correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Technical Illustrating Skills	**Duty No.** R **Task No.** 10

Task: Draw an isometric ellipse using isometric templates as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Drew isometric ellipse correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Technical Illustrating Skills	**Duty No.** R **Task No.** 1

Task: Construct an isometric ellipse using a protractor as required to develop a crawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed isometric ellipse correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Technical Illustrating Skills	**Duty No.** R **Task No.** 12

Task: Draw a perspective view using an assigned problem as required to develop a pictorial drawing.

Achievement Indicators: The learner: Yes No

1. Drew perspective view correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

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Duty: Developing Technical Illustrating Skills

Duty No. R

Task No. 13

Task: Draw a perspective ellipse using perspective templates as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Drew perspective ellipse correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Technical Illustrating Skills	**Duty No.** R **Task No.** 14

Task: Construct a dimetric drawing using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed a drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Technical Illustrating Skills

Duty No. R

Task No. 15

Task: Construct a trimetric pictorial using an assigned problem as required to produce a pictorial.

Achievement Indicators: The learner: Yes No

1. Constructed trimetric pictorial correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

251

Duty: Developing Technical Illustrating Skills

Duty No. R

Task No. 16

Task: Draw a schematic pictorial view using an assigned problem as required to develop a pictorial drawing.

Achievement Indicators: The learner:

	Yes	No
1. Drew schematic pictorial view correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Technical Illustrating Skills	**Duty No.** R **Task No.** 17

Task: Prepare an illustration drawing using a sketch as required to develop a layout.

Achievement Indicators: The learner: Yes No

1. Prepared illustration drawing correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Technical Illustrating Skills

Duty No. R

Task No. 18

Task: Prepare an illustration drawing using photoprints as required to develop an illustration drawing.

Achievement Indicators: The learner: Yes No

1. Prepared illustration drawing correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Technical Illustrating Skills

Duty No. R

Task No. 19

Task: Prepare an illustration drawing using a blueprint as required to develop a pictorial drawing.

Achievement Indicators: The learner: Yes No

1. Prepared illustration drawing correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial specifications.

Tools and Equipment:

Resources:

Duty: Developing Technical Illustrating Skills	**Duty No.** R **Task No.** 20

Task: Prepare an illustration drawing using designs as required to develop a pictorial drawing.

Achievement Indicators: The learner:

	Yes	No
1. Prepared illustration drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Technical Illustrating Skills

Duty No. R

Task No. 21

Task: Prepare an illustration drawing using mock-ups as required to develop a pictori
drawing.

Achievement Indicators: The learner:

	Yes	No
1. Prepared illustration drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Technical Illustrating Skills	**Duty No.** R **Task No.** 22

Task: Prepare an illustration drawing using notes as required to develop a layout.

Achievement Indicators: The learner:	Yes	No
1. Prepared illustration drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Technical Illustrating Skills	**Duty No.** R
	Task No. 23

Task: Construct a plotted grid perspective using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed perspective correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Technical Illustrating Skills

Duty No. R

Task No. 24

Task: Construct a measured perspective illustration using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed illustration correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Technical Illustrating Skills

Duty No. R

Task No. 25

Task: Construct an exploded assembly drawing using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed assembly drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Technical Illustrating Skills

Duty No. R

Task No. 26

Task: Construct a paste-up drawing using an assigned problem as required to develop a layout.

Achievement Indicators: The learner:

	Yes	No
1. Constructed paste-up drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Technical Illustrating Skills	**Duty No.** R **Task No.**

Task: Construct a water color gray-tone drawing using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed water color drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

263

Duty: Developing Technical Illustrating Skills	**Duty No.** R
	Task No. 28

Task: Construct a color drawing using an assigned problem as required to develop a rendering.

Achievement Indicators: The learner:

	Yes	No
1. Constructed color drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Technical Illustrating Skills

Duty No. R

Task No. 29

Task: Retouch photos using an assigned problem as required to correct defects.

Achievement Indicators: The learner: Yes No

1. Retouched photos correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Technical Illustrating Skills

Duty No. R

Task No. 30

Task: Render an airbrush drawing using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Rendered airbrush drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Electronic Drawing Skills

Duty No. 5

Task No. 1

Task: Identify electronic device symbols using an assigned problem as required to properly identify components.

Achievement Indicators: The learner: Yes No

1. Identified electronic device symbols correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Electronic Drawing Skills

Duty No. S

Task No. 2

Task: Construct electronic device symbols using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed electronic device symbols correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Electronic Drawing Skills	**Duty No.** S **Task No.** 3

Task: Construct a wiring diagram using an assigned problem to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed wiring diagram correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement idicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Electronic Drawing Skills

Duty No. S

Task No. 4

Task: Construct an electronic equipment layout using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed an electronic equipment layout correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Electronic Drawing Skills	**Duty No.** 5 **Task No.** 5

Task: Construct a panel layout using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed a panel layout correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Electronic Drawing Skills

Duty No. S

Task No. 6

Task: Construct a panel detail using an assigned problem as required tc develop a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed a panel detail correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Electronic Drawing Skills	**Duty No.** 5 **Task No.** 7

Task: Construct a block diagram using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed a block diagram correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Developing Electronic Drawing Skills

Duty No. 5

Task No. 8

Task: Construct a printed circuit drawing using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner:

	Yes	No
1. Constructed a printed circuit drawing correctly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Electronic Drawing Skills	**Duty No.** 5 **Task No.** 9

Task: Construct an industrial control drawing using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed industrial control drawing correctly- ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

275

Duty: Developing Electronic Drawing Skills

Duty No. S

Task No. 10

Task: Construct integrated circuit cut and peel drawing using an assigned problem as required to develop a drawing.

Achievement Indicators: The learner: Yes No

1. Constructed a intergrated circuit cut and peel drawing correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Developing Electronic Drawing Skills	**Duty No.** 5
	Task No. 10

Task: Construct integrated circuit cut and peel drawing using an assigned problem as required to develop a drawing.

Achievement Indicators: - The learner: Yes No

1. Constructed a intergrated circuit cut and peel drawing correctly - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**
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Duty: Using Employability Skills

Duty No. T

Task No. 1

Task: Investigate employment information using sources of employment information to identify employment opportunities.

Achievement Indicators: The learner:

	Yes	No
1. Developed a list of the prime sources of information concerning opportunities for employment -	____	____
2. Described special procedures, if any, required to utilize services, information, etc. -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:

Resources:

Duty: Using Employability Skills	**Duty No.** T **Task No.** 2

Task: Identify job requirements using health, physical, legal, education, and other occupational information to determine the requirements of an occupation.

Achievement Indicators: The learner:

	Yes	No
1. Listed the significant requirements (health, physical, legal, education, etc.) of the appropriate occupation -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:	**Resources:**

Duty: Using Employability Skills	**Duty No.** T **Task No.** 3

Task: Acquire wage information using available resources to determine the approximate entry wages, general wage range, and significant fringe benefits for an occupation.

Achievement Indicators: The learner:

	Yes	No
1. Listed the approximate entry wages, general wage range, and significant fringe benefits for the appropriate occupation -	____	____
2. Compared these wages and fringe benefits with other selected occupations -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:	**Resources:**

Duty: Using Employability Skills	**Duty No.** T **Task No.** 4

Task: Identify significant non-wage job characteristics using available resources to determine shift requirements, union affiliation, apprenticeships, occupational hazards, characteristics of work environment and other significant job factors.

Achievement Indicators: The learner: Yes No

1. Listed and described the significant non-wage characteristics (e.g., shift requirements, union affiliation, apprenticeships, occupational hazards, characteristics of work environment, etc.) - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:

Resources:

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Duty: Using Employability Skills

Duty No. T

Task No. 5

Task: Explore employment opportunities using available resources to describe local, regional, and national employment opportunities for an occupation.

Achievement Indicators: The learner:

	Yes	No
1. Described the local, regional, and national employment opportunities for the appropriate occupation -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:

Resources:

Duty: Using Employability Skills

Duty No. T

Task No. 6

Task: Analyze career ladder using available resources to describe job progression in an occupation.

Achievement Indicators: The learner: Yes No

1. Described the career ladder associated with the appropriate occupational area - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:

Resources:

Duty: Using Employability Skills	**Duty No.** T
	Task No. 7

Task: Identify personal criteria with information about available alternatives using a decision-making situation and procedures and skills in decision-making to choose a job, further training or other alternatives.

Achievement Indicators: The learner:

	Yes	No
1. Compared personal criteria with information about a job, further training or other alternatives -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:	**Resources:**

Duty: Using Employability Skills

Duty No. T

Task No. 8

Task: Prepare a resume using personal information to apply for a job.

Achievement Indicators: The learner:

	Yes	No
1. Prepared a resume -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:

Resources:

285

Duty: Using Employability Skills	**Duty No.** T
	Task No. 9

Task: Write a letter of application using personal notes to apply/inquire about a job.

Achievement Indicators: The learner:

	Yes	No
1. Wrote a letter of application/inquiry -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:	**Resources:**

Duty: Using Employability Skills	**Duty No.** T
	Task No. 10

Task: Complete a job application using personal notes to apply for a job.

Achievement Indicators: The learner:

	Yes	No
1. Completed a job application -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:	**Resources:**

Duty: Using Employability Skills

Duty No. T

Task No. 11

Task: Demonstrate appropriate dress using a knowledge of job requirements to comply with standards of on-the-job dress and grooming.

Achievement Indicators: The learner:

	Yes	No
1. Described and/or dressed in the attire of the appropriate occupational area, including:		
a. grooming -	____	____
b. required health and safety equipment -	____	____
c. uniforms -	____	____
d. other ______________________________ -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:

Resources:

Duty: Using Employability Skills

Duty No. T

Task No. 12

Task: Complete a job interview using communication and interpersonal skills to become employed.

Achievement Indicators: The learner:	Yes	No
1. Described and/or demonstrated appropriate characteristics for job applicants including:		
a. attire -	____	____
b. grooming -	____	____
c. conduct during the interview -	____	____
2. Described and/or demonstrated the interview process -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:

Resources:

Duty: Using Employability Skills

Duty No. T

Task No. 13

Task: Describe personal criteria using references to identify acceptable job offers.

Achievement Indicators: The learner: Yes No

1. Listed personal criteria (financial, social, etc.) which described a job offer - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:

Resources:

Duty: Using Employability Skills

Duty No. T

Task No. 14

Task: Demonstrate interpersonal skills to achieve successful relationships with others.

Achievement Indicators: The learner:

	Yes	No
1. Identified probable causes for conflicts and at least one possible action to relieve the conflict -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:

Resources:

Duty: Using Employability Skills

Duty No. T

Task No. 15

Task: Identify source of continuing education for an occupation using available resources to identify career ladder alternatives.

Achievement Indicators: The learner:

	Yes	No
1. Described the types and sources of related continuing education for the appropriate occupation and/or advancement within the career ladder associated with the occupation -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:

Resources:

Duty: Using Employability Skills

Duty No. T

Task No. 16

Task: Describe job termination procedures using a knowledge of the occupational area to leave a particular job.

Achievement Indicators: The learner:	Yes	No
1. Described procedures and practices for terminating a job -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:

Resources:

DRAFTING TOOL AND EQUIPMENT LIST

EQUIPMENT

- Drafting Desk/Stool
- Straight Parallel Edge
- Straight Edge
- Vinyl Board Cover
- 45 Degree Triangle
- Adjustable Traingle
- Scale (fractional)
- Scale (decimal-metric)
- 4" Bow Compass
- 6" Bow Compass
- Drop Campass
- Beam Compass
- Dividers
- Proportional Dividers
- Slot Lettering Guide
- Lettering Templates
- Protractor
- Radium Guide
- Erasing Shield
- Brush
- Drafting Pencil Sharpener
- Lead Pointer
- Lead Holders (.5mm and .7mm)
- Pro Draft Template
- General Circle Template
- Large Circle Template
- Ellipse Template (various degrees)
- French Curves (various sizes)
- Electrical Templates (as required)
- Adjustable Ship Curve
- Scissors
- Air Brush/Compressor
- Mailing Tube
- Technical Ink Pens
- Ink Lettering Equipment
- White Copy Print Machine
- Plain Paper Copier

SUPPLIES

- Drawing Media
    - Buff Paper
    - ¼ inch Graph Paper
    - Bond Tracing Paper
    - Vellum Tracing Paper
    - Plastic Drawing Film
    - Print Paper
    - Illustration Board
- Erasers
- Drafting Pencils (various degrees)
- Sandpaper Paddles
- Trasfer Letters
- India Ink
- Ink Cleaner
- Compass Leads
- Cleaning Supplies
- Drafting Tape
- White Glue
- Water Color Paints
- Colored Chalk
- Felt Tip Pens

STUDENT ACHIEVEMENT RECORD

MECHANICAL DRAFTING

STUDENT ____

INSTRUCTIONS:

Mark each student's level of competence according to the following guide:

LEVEL	GUIDE
1	Student has been exposed to task
2	Task accomplished with assistance
3	Task accomplished to criteria by student
4	Ability to teach or demonstrate the task to others

TASK	LEVEL	DATE
A. PREPARING TO DRAW		
1. Adjust drafting table.		
2. Clean drafting tools.		
3. Select drafting (media).		
4. Select proper sheet size.		
5. Fasten paper.		
6. Select drafting pencils.		
7. Select leads.		
8. Point leads.		
B. DEMONSTRATING BASIC DRAWING		
1. Draw guidelines.		
2. Draw break lines.		
3. Erase lines.		
4. Construct specified lines to proper line quality.		
5. Measure line segments using a fractional scale.		

TASK	LEVEL*	DATE
B. DEMONSTRATING BASIC DRAWING (continued)		
6. Draw line segments using a fractional scale.		
7. Measure line segments using a decimal inch scale.		
8. Draw line segments using a decimal scale.		
9. Measure line segments using a metric scale.		
10. Draw line segments using a metric scale.		
11. Draw horizontal lines.		
12. Draw vertical lines.		
13. Draw angular lines.		
14. Draw parallel lines.		
15. Draw perpendicular lines.		
16. Draw circles.		
17. Construct arrowheads.		
18. Draw various line weights.		
19. Construct gothic lettering.		
20. Construct a drawing.		
C. DEVELOPING GEOMETRIC CONSTRUCTION		
1. Measure angles.		
2. Lay out given angles.		
3. Set compass.		
4. Draw curved lines.		
5. Draw radii.		
6. Construct a tangent line.		
7. Bisect a line.		
8. Divide given lines.		
9. Bisect an arc.		
10. Bisect an angle		
11. Construct a regular hexagon.		
12. Construct a pentagon.		
13. Construct an octagon.		
14. Construct a circle.		
15. Construct arcs tangent to given angles.		
16. Construct arcs tangent to given arcs.		

TASK	LEVEL	DATE
C. DEVELOPING GEOMETRIC CONSTRUCTION (continued)		
17. Construct an ellipse.		
D. DEVELOPING PICTORIAL DRAWING TECHNIQUES		
1. Sketch a pictorial drawing.		
2. Construct an isometric drawing.		
3. Construct oblique drawing.		
E. DEVELOPING ORTHOGRAPHIC PROJECTION TECHNIQUES		
1. Prepare a straight line sketch.		
2. Prepare a circle sketch.		
3. Prepare curved line sketch.		
4. Sketch orthographic views.		
5. Draw orthographic views.		
6. Construct the third view.		
F. DEMONSTRATING DIMENSIONING SKILLS		
1. Place overall dimensions.		
2. Place location dimensions.		
3. Place size dimensions with internal diameters.		
4. Place size dimensions with various radii.		
5. Place dimensions with inclined planes.		
6. Place size dimensions with various tapers.		
7. Place size dimensions with various examples of chamfers.		
8. Place size dimensions with examples of keyways.		
9. Place size dimensions with examples of knurled handles.		
10. Apply decimal dimensioning system .		
11. Apply metric dimensioning system.		
12. Apply conventional dimensioning system.		
13. Apply tabular dimensioning practices.		
14. Apply datum line dimensioning practices.		
15. Apply plus-minus dimensions.		

TASK	LEVEL	DATE
F. DEMONSTRATING DIMENSIONING SKILLS (continued)		
16. Apply limits dimensioning.		
17. Apply clearance fit tolerance.		
18. Apply interference fit tolerance.		
19. Apply transitional fit tolerance.		
20. Apply basic hole and shaft systems..		
21. Add general notes.		
22. Add local notes.		
23. Apply sub-title information.		
24. Apply finish symbols.		
25. Apply surface control symbols.		
26. Apply geometric dimensioning symbols.		
G. DEVELOPING SECTIONAL VIEWS		
1. Identify sectional views.		
2. Draw sectional views.		
3. Construct a full section.		
4. Construct a half section.		
5. Construct an offset section.		
6. Construct a removed section.		
7. Construct a revolved section.		
8. Construct a broken-out section.		
9. Construct an aligned section.		
10. Construct ribs in section.		
11. Construct webs in section.		
12. Construct spokes in section.		
13. Construct machined holes in section.		
H. DEVELOPING AUXILIARY VIEWS		
1. Identify a normal surface.		
2. Identify an inclined surface.		
3. Identify an oblique surface.		
4. Identify auxiliary views.		
5. Draw auxiliary views.		

TASK	LEVEL	DATE
H. DEVELOPING AUXILIARY VIEWS (continued)		
6. Construct an oblique surface auxiliary view.		
I. DEMONSTRATING SKILLS IN APPLYING THREAD AND FASTENING TECHNIQUES		
1. Identify common fasteners.		
2. Identify screw thread terms.		
3. Identify thread symbolism.		
4. Draw a simplified thread symbol.		
J. IDENTIFYING SHOP PROCESSES		
1. Identify machining operations.		
2. Identify manufacturing processes.		
3. Construct standard structural shapes.		
4. Identify the non-ferrous materials.		
5. Identify the heat treating processes.		
K. DEMONSTRATING JOB ENTRY SKILLS		
1. Select drafting media.		
2. Letter appropriate systems.		
3. Draw arrowheads.		
4. Complete title block.		
5. Make revisions.		
6. Apply change information.		
7. Reproduce a drawing.		
8. Apply reference information.		
9. Fold prints.		
10. Identify symmetrically opposite parts.		
11. Apply symmetrical opposite part subtitle.		
12. Calculate weight.		
13. Calculate volumes.		
14. Solve unknown angles.		
15. Construct assembly drawing.		
16. Construct details on assembly drawings.		

TASK	LEVEL	DATE
K. DEMONSTRATING JOB ENTRY SKILLS (continued)		
17. Construct an ink drawing.		
L. DEVELOPING CASTING DRAWING SKILLS		
1. Measure actual size.		
2. Identify need for a cored hole on a cast part drawing.		
3. Apply radii features.		
4. Project runouts.		
5. Identify the sand cast process.		
6. Identify the centrifugal casting process.		
7. Identify precision investment casting process.		
8. Identify the lost wax casting process.		
9. Apply notes.		
M. DEVELOPING DETAILING DRAWING SKILLS		
1. Identify standard purchase parts.		
2. Identify standard clamps.		
3. Identify various gauges.		
4. Identify basic welding symbols.		
5. Trace a detail drawing of a specified part.		
6. Construct a detail drawing of a cast part.		
7. Construct a detail drawing of a machined part.		
8. Construct a detail drawing of a forged part.		
9. Construct a detail drawing of a welded component.		
10. Construct a detail drawing of a metal stamping.		
11. Construct a detail drawing of parts from a jig assembly drawing.		
12. Construct a detail drawing of a drilling fixture assembly.		
13. Construct a detail drawing of a checking fixture assembly.		
14. Construct detail drawing of a holding fixture for milling operations.		

TASK	LEVEL	DATE
N. DEVELOPING ASSEMBLY DRAWING SKILLS		
1. Construct a working assembly drawing.		
2. Construct an outline assembly drawing.		
3. Construct a sectional assembly drawing.		
4. Construct a sub-assembly drawing.		
O. DEVELOPING DESCRIPTIVE GEOMETRY SKILLS		
1. Draw true length lines.		
2. Draw the edge view.		
3. Draw the true angle.		
4. Draw the end view.		
5. Measure the minimum distance using a point and plane to determine a dimension.		
6. Measure the minimum distance using a point and a line.		
7. Draw the true view.		
8. Develop the intersection line using a plane and a prism.		
9. Develop the intersection line using a plane and pyramid.		
10. Develop the intersection line using two prisms.		
11. Develop the intersection line using two cylinders.		
12. Develop the intersection line using two pyramids.		
13. Develop the intersection line using two cones.		
14. Construct the blank pattern using two views of a prism.		
15. Contruct the blank pattern using two views of a cylinder.		
16. Construct the blank pattern using two views of a pyramid.		
17. Construct the blank pattern using two views of a cone.		
P. DEVELOPING BODY DRAFTING SKILLS		
1. Construct a body inch line section.		
2. Construct a true radial section.		

TASK	LEVEL	DATE
P. DEVELOPING BODY DRAFTING SKILLS (continued)		
3. Construct a removed body section		
4. Construct a revolved body section.		
5. Construct a telltale section.		
6. Construct a third view that includes a body drawing on inch grid.		
7. Construct a third view that includes a body drawing on metric grid.		
Q. DEVELOPING CAM AND GEAR LAYOUT SKILLS		
1. Construct the layout for a uniform cam motion.		
2. Construct the layout for a harmonic cam motion.		
3. Construct the layout for a uniform accelerated cam motion.		
4. Construct the layout for uniform accelerated and retarded cam motion.		
5. Construct the layout for a drum cam.		
6. Construct the layout for a spur gear.		
7. Construct the layout for a bevel gear.		
8. Construct the layout for a worn gear.		
R. DEVELOPING TECHNICAL ILLUSTRATING SKILLS		
1. Transfer rub-on letters.		
2. Prepare a sketch using objects.		
3. Prepare a sketch using photographs.		
4. Prepare a sketch using blueprints.		
5. Select proper orthographic view.		
6. Select the proper scale.		
7. Construct an enlarged drawing.		
8. Construct a reduced drawing.		
9. Construct an isometric box drawing.		
10. Draw an isometric ellipse using isometric templates.		
11. Construct an isometric ellipse using a protractor.		
12. Draw a perspective view.		

TASK	LEVEL	DATE
R. DEVELOPING TECHNICAL ILLUSTRATING SKILLS (continued)		
13. Draw a perspective ellipse.		
14. Construct a dimetric drawing.		
15. Construct a trimetric pictorial.		
16. Draw a schematic pictorial view.		
17. Prepare an illustration drawing using a sketch.		
18. Prepare an illustration drawing using photoprints.		
19. Prepare an illustration drawing using a blueprint.		
20. Prepare an illustration drawing using designs.		
21. Prepare an illustration drawing using mock-ups.		
22. Prepare an illustration drawing using note.		
23. Construct a plotted grid perspective.		
24. Construct a measured perspective illustration.		
25. Construct an exploded assembly drawing.		
26. Construct a paste-up drawing.		
27. Construct a water color gray-tone drawing.		
28. Construct a color drawing.		
29. Retouch photos.		
30. Render an airbrush drawing.		
S. DEVELOPING ELECTRONIC DRAWING SKILLS		
1. Identify electronic device symbols.		
2. Construct electronic device symbols.		
3. Construct a wiring diagram.		
4. Construct an electronic equipment layout.		
5. Construct a panel layout.		
6. Construct a panel detail.		
7. Construct a block diagram.		
8. Construct a printed circuit drawing.		
9. Construct an industrial control drawing.		
10. Construct integrated circuit cut and peel drawing.		

TASK	LEVEL	DATE
T. USING EMPLOYABILITY SKILLS		
1. Investigate employment information.		
2. Identify job requirements.		
3. Acquire wage information.		
4. Identify significant non-wage job characteristics.		
5. Explore employment opportunities.		
6. Analyze career ladder.		
7. Identify personal criteria with information about available alternatives.		
8. Prepare a resume.		
9. Write a letter of application.		
10. Complete a job application.		
11. Demonstrate appropriate dress.		
12. Complete a job interview.		
13. Describe personal criteria.		
14. Demonstrate interpersonal skills to achieve successful relationships with others.		
15. Identify source of continuing education for an occupation.		
16. Describe job termination procedures.		

CLASS ACHIEVEMENT RECORD

TASK No. NAME																					

GLOSSARY OF VOCATIONAL TERMS

Advisory Committee. An appointed group of concerned citizens and educators representative of the occupations for which training is given in the local school, organized for the purpose of helping to plan vocational programs and offering counsel on their development and operation.

Apprenticeship. An instructional program in which the learner works directly under a qualified craft worker to learn a trade.

Career Development. A lifelong process involving a series of experiences, decisions, and interactions, which, taken cumulatively, results in the formulation of a viable self concept and provides the means through which that self concept can be implemented both vocationally and avocationally.

Career Education. The total effort of public education and the community to help all individuals become familiar with the values of a work-oriented society, to integrate such values into their personal value systems, and to implement those values into their lives in such a way that work becomes possible, meaningful, and satisfying to each individual.

Career Interest. The student's decision to pursue a job description or cluster within a vocational education program area.

Clustar of Occupations. Occupations for which a common core of instruction can prepare, as for example automotive trades which prepares for such occupations as auto mechanic, auto body repairman, automotive services, auto inspector, and brake adjuster.

Completion. That statistic which describes individuals, including early leavers who have achieved their immediate objectives in preparation for entry or progressing in an occupational field and have left the vocational education program.

Cooperative Vocational Education. An instructional plan which combines learning experiences gained through regularly scheduled supervised employment in the community and vocationally oriented in-school instruction.

Coordinator (Cooperative Education). A member of a local school staff who teaches occupational and related subject content to students preparing for employment and coordinates the efforts of all helpful agencies which can assist in a training program designed to meet the needs of learners in a cooperative vocational education program. At times the coordinator may have varying degrees of responsibility in adult vocational education.

Course. A defined segment of a program.

Course Outline. An outline of subject matter to be presented or learning experiences planned for a course.

Course of Study. A guide prepared by administrators, supervisors, and teachers of a particular school or school system as an aid to teaching a given subject or area of study. More detailed than a course outline and includes statement of methods, materials, and equipment needed.

Curriculum. A sequence of educational and skill development experiences designed to accomplish a particular purpose. The curriculum for a program of vocational/technical education is designed to prepare an individual for entry, promotion, or upgrading in a specific occupation or cluster of occupations. (See definition of Cluster of Occupations.)

Disability. An injury or illness, temporary or permanent, which prevents workers from carrying on their usual occupations. A disability retirement is retirement because of physical inability to perform the job.

Disadvantaged. Disadvantaged persons are those who have academic, socioeconomic, cultural, or other handicaps that prevent them from succeeding in a regular vocational program designed for persons without such handicaps, and who for that reason require specially-designed educational programs and related services, or both, in order for them to benefit from a vocational program.

Discharge. Dismissal of a worker from employment. The term implies discipline for unsatisfactory performance and thus is usually limited to dismissals for such reasons as insubordination, absenteeism, or inefficiency.

Discrimination. Unequal treatment of workers in hiring, employment, pay or conditions of work because of race, national origin, creed, color, sex, age, union memebership activity, or any other characteristics not related to ability or job performance. Discrimination is prohibited by Federal, State, and local laws.

Duty. A large segment of work performed by an individual. It is one of the distinct major activities involved in the work performed, and it is composed of several related tasks.

Employer. General term for any individual, corporation, or other operating group which hires workers. The term "employer" and "management" are often used interchangeably.

Evaluation. A measuring or assessing of effectiveness. An on-going process by which effectiveness and progress are determined, used to guide change and offer directions for program modification and operation.

Exploratory Experiences. Those experiences in a variety of occupations, which help the students identify job traits in relation to their abilities and characteristics, and to assist them in making realistic and appropriate occupational choices.

Follow-Up Report. Usually a composite short-term or long-term report of former students indicating their present employment status or other present commitments (education, military, homemaking). More sophisticated follow-up studies seek to assess the effectiveness of the cooperative training experience to the student's present situation. Individual follow-up information is usually maintained in a student's record file.

Follow-Up Study. A study of the occupational status and progress of former students, as a means of evaluating effectiveness of the school's program of occupational preparation, of improving such preparation, and/or of determining needs of former students for further services.

General Advisory Committee. A committee that advises an institution as to its vocational/technical education activities overall. (See also; Occupational Advisory Committee).

Guidelines. The means by which significant characteristics in the evaluation of an institution or program are identified or measured.

Handicapped. Handicapped persons are those who are mentally-retarded, hard of hearing, deaf, speech-impaired, visually-handicapped, seriously emotionally disturbed, crippled, or other health-impaired persons who, by reason of their handicapping conditions, cannot succeed in a regular vocational or consumer and homemaking education program without special educational assistance, or who require a modified vocational program.

Hazardous Occupation. An occupation designated by State of Michigan and/or federal law to be considered dangerous to the health and well-being of minors.

Individualized Instruction. That type of instruction that provides techniques through which the teacher can work directly with individual students, as opposed to group instruction.

Inservice Teacher Education. All educational, and professional activities contributing to professional competencies which a person engages in after becoming employed, such as: formal course work, work experience, internships, practicums, seminars, and independent-individualized studies.

Internship. Student performs in approved job situation. Usually paid and given credit for the work. In-school instruction usually given before the work period and seldom tied in directly with job experiences. Typically one semester or more. Internship is a term used for collegiate experiences.

Job. The duties and tasks actually performed by a specific individual.

Job Analysis. See: Occupational Analysis.

Job Description. A written statement listing the elements of a particular job or occupation. The statement may include the purpose of the job, duties, equipment used, qualifications, training requirements, physical and mental demands, and working conditions.

Job Placement. Those organized activities performed by a guidance counselor or job placement coordinator designed to assist students in locating employment.

Job Type. A group of jobs that are composed of essentially the same significant duties and tasks.

Learning Resources. All textbooks, reference materials, equipment, supplies and other items and materials needed for successful achievement of learning objectives.

Manpower. People available to perform needed labor.

Management System. A technique employed to provide an organized method of accomplishing stated mission, goals, and objectives.

Minimum Wage. The lowest rate of pay, established by law or through collective bargaining, at which covered workers may be employed. The minimum wage is usually expressed as an hourly rate.

M.O.I.S. Michigan Occupational Information System.

National Occupational Competency Exam. A written and a performance exam developed by the National Occupational Competency Testing Institute, sponsored by T&I Education, for the purpose of determining the degree of competency that one has in a specific trade and industrial occupation.

Occupational Analysis. A technique for finding out what a worker in a specific occupation does and what he needs to know to perform his job efficiently, which is then used as a means of determining the teaching content in an occupational preparatory program.

Occupational Advisory Committee. A committee advising as to a program preparing for a particular occupation or cluster of occupations.

Occupational Competence. Includes technical knowledge and skills; manipulative skills; communication skills; human relations skills; work habits; and the ability to reason, to solve problems, to think independently, and to make judgments necessary for satisfactory employment in the occupation.

Occupational Field. A group of recognized occupations having many similarities, including the following characteristics in common; the type of work performed; the basic aptitudes, and the acquired knowledge and training required; the tools, machines, instruments, and other equipment used; and the basic materials used.

Occupational Objective. An occupational goal, selected by the student, the attainment of which is the purpose for his/her vocational instruction.

On-The-Job Training. Instruction in the performance of a sequentially planned task given a student-learner by the employer during the usual working hours of the occupation. Learning experiences at the training station comprises both the application of the theory of and the technical skill aspects of the learning situation, and/or the proper character, attitude and personality development of the student-learner as general goals of the training situation at the training station.

Occupational Information. Systematically organized data used by guidance personnel and others for the purpose of helping persons make a vocational choice. Material concerns the nature of the work, duties, responsibilities, and compensations involved in the several vocations, including information about employment outlook, promotional opportunities, and entrance requirements.

Occupational Objective. A specific recognized occupational goal, selected by the student, the attainment of which is the purpose of his vocational instruction. Also called: Career Objective.

Placement Coordinator. A person who provides local leadership to plan and initiate placement services.

Placement Services or Placement Activities. A series of coordinated activities for students planning further education or seeking part-time or full-time employment either for additional education, for on-the-job training or for earning a living.

Preparatory Instruction. Instruction preparing students for full or part-time employment. Also serves to prepare students to enter and advance in an occupation. Also serves to equip workers with new or different skills demanded by technological changes.

Preparatory Program. A preparatory program provides vocational instruction designed to prepare individuals for gainful employment as semi-skilled or skilled workers or technicians or semi-professionals in recognized occupations. Preparatory programs are provided in the school laboratory/classroom.

Professional Organizations. Groups of personnel interested in and working toward the improvement, advancement, and upgrading of activities, not only in their specific field, but also of activities in related fields of endeavor such as the American Vocational Association.

Program (Vocational Education). "Vocational program" means laboratory, simulation or instruction based upon individually designed learning experiences in a vocational subject preparing the student for competencies required in a recognized occupation coded in accordance with the most recent vocational education listing of programs by the United States Department of Education.

Related Vocational Instruction. In-school courses specifically designed to improve personal and social skills, provide needed basic education (remedial), and/or develop relevant occupational skills and knowledges. The course should be regularly scheduled, should complement the learning experiences at the training station, and should be planned and developed to meet the specific needs of the individual student. The content of this course should consist of the theory of the occupational skill, the specific related information, and the general related instruction necessary to achieve personal success in the world of work.

Resources. People, money and materials available to an institution in carrying out its purposes.

School Community. The total community from which the school draws students, support, and resources.

School District. An administrative unit at the local level which exists primarily to operate public schools or to contract for public school services. Normally, taxes can be levied by such units for school purposes. These units may or may not be coterminous with county, city or town boundaries. This term is used synonymously with the term "local basic administrative unit."

Skills. The acquisition of knowledge, ability, proficiency, dexterity and technical expertness that enables one to develop a learned power of doing a thing completely.

State Plan. The document submitted by the state board for vocational education to the U. S. Office of Education describing the state's vocational education program. Includes policies followed by the state in maintaining, extending, and implementing existing programs and establishing new programs to meet the intent of the Vocational Education Acts. Prerequisite for receiving federal funds under the Acts.

Survey, Community. A fact-finding study of socioeconomic conditions and resources, community agencies, industries, business, farming, institutional practices, problems and practices of families, etc., as they exist at a given time in a given community. It is generally used by the school as a guide in revising school offerings to meet local needs.

Survey, Occupational. A form of occupational census, taken by personnel trained to determine the number of qualified employees in a designated occupation in a specified geographic or economic area; and to evaluate the need for increasing or limiting the numbers available for employment in the occupations surveyed.

Task. A unit of worker activity that is intermediate in specificity between a function and a procedural work step or action. It is a discrete unit of work performed by an individual; that is, the unit usually has a definite beginning and ending, and it is performed within a limited period of time.

Task Analysis. A detailed listing of skills necessary to perform a clearly defined, specific job, organized into a logical sequence and which may be used for teaching employment, or classification purposes.

Task Inventory. An instrument used for conducting an occupational survey. It consists of items of identification and background information and a list of appropriate duty and task statements.

Teacher-Coordinator (Cooperative Vocational Education). A member of the local school staff who teaches technical and related subject matter to students preparing for employment and coordinates classroom instruction (related classroom) with learning activities at the training station. The coordinator is also responsible for the evaluation procedures of the program.

Trade and Industrial. Instruction planned to develop basic manipulative skills, safety practices, judgments, technical knowledge, and related occupational information for the purpose of preparing persons for initial employment in the trades and industrial occupations.

Training Agreement. A statement of fundamental agreements regarding the participation of a student in a work environment. Initiated by the school, the agreement reflects a voluntary and cooperative commitment on the part of the coordinator, employer, student, and parents/guardians.

Training Plan. A format for delineating, for each student, the learning experiences and tasks to be undertaken at the training station, often paralleled with classroom units of instruction. The training plan, cooperatively determined, usually becomes a part of the training agreement.

Training Station. The establishment providing learning experience for the student-learner.

VICA. Vocational Industrial Clubs of America. The youth organization for students at secondary and post-secondary levels who are in preparation for employment in trade & industrial occupations.

Vocational Education. Organized educational programs, services, and activities which are directly related to the preparation of individuals for paid or unpaid employment, or for additional preparation for a career requiring other than a baccalaureate or advanced degree.

Vocational Student Organizations. Organizations for student-learners that complement the vocational education program. Recognized student-learner organizations for vocational education are: DECA, Distributive Education Clubs of America; FFA, Future Farmers of America; FHA-HERO, Future Homemakers of America-Home Economics Related Occupations; HOSA, Health Occupations Students of America; OEA, Office Education Association at the post-secondary level in Michigan and BOEC, Business Office Education Clubs at the secondary level; VICA, Vocational Industrial Clubs of America. Organizations for students enrolled in vocational education programs, with national, state and local units, the activities of which are an integral part of the instructional program.

Work Experience and Career Exploration (WECEP). Program emphasizes learning experiences at the training station based on individual needs and provides learning experiences for those students whose needs cannot be served by regular cooperative education programs.

Work Experience Program. Students perform tasks of the actual job and may or may not be paid. Typically engaged in for general education values, including exploratory. Usually one semester or less. Limited school supervision; usually no related class.

Work Observation Program. Student observes work, does not perform tasks except to understand them. Unpaid. Plan is usually few weeks in length and may be tied in with a class in which occupational information is discussed.

Work-Study Program. A federal program designed to provide a vocational education student with employment in the public sector and supplemental income while attending school. The vocational program does not necessarily have to be related to the job.

RESOURCE LIST

1. Drafting for Industry
W.C. Brown
Goodheart-Willcox Publishers
South Holland Illinois 1974

2. Industrial Arts Drafting
Walker and Plevyak
Goodheart-Willcox Publishers
South Hallnad, Illinois 1964

3. Geometry of Engineering Drawing
Hood and Palmerlee
McGraw-Hill Publishers
New York, New York 1958

4. Tool and Die Drafting
Hoover and Schumacher
2nd Edition, 1974
Prakken Publications
AnnArbor, Michigan 48107

5. Drafting Worksheets
W.D. Spence
Bennett Publisher
Peoria, Illinois 1972

6. Fundamentals of Engineering Drawing, 5th ed.
Luzadder
Prenctice-Hall Publishers
Englewood Cliffs, New Jersey 1965

7. Mechanical Drafting, 8th ed.
French, Sevenson, Helsel, and Urbanick
McGraw-Hill Publishers
New York, New York 1963

9. Engineering Graphics, 2nd ed.
Giesecke, Mitchell, Hill, and Loving
MacMillan Publishers
New York, New York 1968

10. Exploring Drafting
J.R. Walker
Goodheart-Willcox, Inc. Publishers
South Holland, Illinois 1978

11. Jig and Fixture Design - Volumes 1 and 2
Ewald L. Witzel
Delmar Publishers, Inc.
Albany, New York 1947

12. Sheet Metal Pattern Drafting, 4th ed.
Daugherty, Powell, and Foster
Charles A. Bennett Co., Inc. Publisher
Peoria, Illinois 1961

13. ANSI Standards:

Y14.5 (1973) Dimensioning and Tolerancing
Y14.3 (1975) Multi and Sectional View Drawing
Y14.1 (1975) Drawing Sheet Size and Format
14.2 (1973) Line Conventions and Lettering
14.6 (1957) Screw Threads
14.7 (1958) Gears
Y14.9 (1958) Forgings
14.10 (1959) Metal Stampings
14.15 (1966) Electrical
14.17 (1966) Fluid Power
14.36 (1978) Surface Texture

14. Graphic Language for the Skilled Trades

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1979 II Conventions and Symbols (5th revision 1979)
III Three Dimensional Shape
IV Advanced Techniques

National Reproductions Corp.
433 East Larner
Detroit, Michigan 48226

15. Technical Drawing, 7th ed.
Giesecke, Mitchell, Spencer, and Hill
MacMillan Publishing Company
New York, New York 1980

16. Machine Drafting
Herbert W. Yankee
McGraw-Hill, Inc. Publishers
New York, New York 1966

17. Descriptive Geometry/Schaum Outline
Minor C. Hawk
McGraw-Hill Publishers
New York, New York 1962

18. Practical Descriptive Geometry
Haver, Panos and Thompson
MCCC South Campus Book Store
Mt. Clemens, Michigan 1978

19. Body Drafting Theory Volumes I and II
Gene Haver
MCCC Bookstore
40005 Moravian
Mt. Clemens, Michigan 48043 1969

20. Catalogs

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